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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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SPECIAL NOTICE.—Just as we go to press, Secretary Forstall informs us that the Southeastern Passenger Association, covering the territory south and west of the Virginias, and south and east of the Ohio and Mississippi rivers, has refused to grant a reduced transportation rate. The Southwestern Passenger Bureau, for travel from points in Southern Missouri, has also declined to make any concession.

[OFFICIAL NOTICE.]

Thirtieth Annual Meeting, American Gas Light Association.

OFFICE OF THE SECRETARY,
NEW YORK CITY, Sept. 1, 1902.

General Announcement.—There will be a meeting of the American Gas Light Association held at New York city, October 15th to 17th, 1901.

The meeting will be called to order by the President, Wm. R. Beal, of New York city, at 10 A.M., Wednesday, October 15th.

The meeting hall will be the breakfast room in the New York Athletic Club House, corner 59th street and 6th avenue.

The headquarters will be at the Plaza Hotel, 59th street and 5th avenue.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed, stamped envelope should be inclosed, as misunderstandings may thereby be averted.

The Plaza Hotel has guaranteed to accommodate 100 persons attending the meeting, at the following rates for rooms:

American plan: Single rooms $5 per day; double rooms, occupied by two persons, from $9 per day (that is, $4.50 for each person) and upwards. Some of these rooms have baths and some are without baths. The ones with baths will go to those applying first.

European plan: Single rooms, $2.50 per day; double rooms, occupied by two persons, $4 per day (that is, $2 per day for each person) and upwards. The remarks as to bath rooms on the American plan apply here also.

The Savoy and the Netherland Hotel, both situated at 59th street, on the opposite side of 5th avenue from the Plaza, have each guaranteed to accommodate 50 persons at the following rates, on the European plan:

Single rooms, without bath, $2 per day. Single rooms with bath $3 per day. Double rooms with bath, occupied by two persons, $5 and $6 per day (that is, $2.50 and $3 per day for each person). For those desiring suites there will be a limited number at from $8 to $14 per day.

An effort will be made to obtain rates from some other hotels in the vicinity, and, if successful, notice will be sent to the members before the meeting.

The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will, at the door, receive a special card upon which he will find his name, address, etc., as it appears on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary.

Remember, all applications must be in the Secretary's hands by October 15th, at the very latest, otherwise they will not be acted upon at this meeting.

LIBRARY OF CONGRESS
OCT. 6 1902
SMITHSONIAN DEPOSIT.

The list of papers to be read at the meeting is as follows:

"Some Notes on Cement Masonry," by Mr. I. N. Knapp, Philadelphia, Pa.

"The Care and Maintenance of Incandescent Gas Burners," by Mr. McDougald Dexter, Columbus, Ga.

"The Cleaning and Repairing of Gas Stoves," by Mr. Geo. S. Clarke, Kansas city, Mo.

"Gas Rates and a Franchise Tax," by Mr. Geo. McLean, Dubuque, Ia.

Also several other papers, the exact titles of which have not yet been decided upon.

If the papers are of a sufficiently high standard, the Beal medal will be awarded to the author of the best paper presented, the question of which is best to be decided by the proper committee.

The officers are endeavoring to arrange for a lecture on some subject of interest to the members, to be delivered during the meeting.

In addition to the papers and lecture, the report of the Research Committee will deal with the question of Pipe Standards, referred to the Committee at the last meeting, and with other subjects that should give rise to a good discussion; and there will be an interesting report from the Committee on Uniform Accounts. During the days of the meeting all the announcements will be posted on the bulletin boards at the headquarters and meeting hall. All members are warned to take notice thereof accordingly. All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers and the local committee in their work, by affording a ready means of recognition.

In order that the "Year-Book," containing the report of this meeting, may be published and issued to the members immediately after the meeting, notice is hereby given that, if any of the speakers at this meeting desire to correct their remarks before they are printed, they will be given an opportunity before leaving New York city, but not after. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all the reports will be turned in to the printer immediately after the adjournment of the meeting.

[Here follows a detailed statement respecting the special rates for transportation—one fare and one-third, going and returning by the same route—that have been promised by the named Passenger Associations. These include the Trunk Line Passenger Association, the Central Passenger Association, the Western Passenger Association and the Southeastern Passenger Association. This series virtually means that any member of the Association may avail himself of the shortened fare under the certificate plan.]

Special.—The entertainment as now planned will include for the ladies a carriage ride on one afternoon and a theater party on the evening of the banquet. For the members there will be provided a banquet at the New York Athletic Club on Thursday evening, and parties will be organized to visit the various gas works, or some of the large electric power stations, or both, on Friday, and if possible an inspection will also be made of part of the work on the underground railway now building in New York at a point where this work has been practically completed. You will be notified later of the price of the tickets for the banquet and other entertainment.

Be sure to obtain a railroad certificate when buying your ticket for New York. The greater the number of certificates handed in, the easier it is to get the reduction in rates for future meetings, since the railroad officials count the certificates turned in as marking the full attendance. In our case the number of certificates is from 50 to 100 less than that of the persons in attendance, and our requests for lower rates are not given the consideration they should receive. Apply for ticket and certificate at least 30 minutes before train time. Each person must sign his own certificate at time of purchasing tickets for New York. Be sure to hand the Secretary your certificates, accompanied by 25 cents for each one, as soon as you reach the headquarters. Apply for return ticket at least 30 minutes before train time, and have your certificates with you. All persons, ladies included, attending the meeting are entitled to the reduced rates from the territories named. Members will please hand their certificates to the Secretary or his clerk upon arrival at place of meeting. If there are 100 members present, holding certificates, each certificate will then be properly indorsed and handed back to the owner before adjournment.

Any members having questions which they desire to put into the question box should send the same to the Secretary as soon as possible, in order to give him an opportunity to have them printed and distributed to the members before the meeting, so as to secure for them careful attention.

ALFRED E. FORSTALL, Secretary.

BRIEFLY TOLD.

THIRTIETH ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.—All the preliminaries for the successful carrying on of the Thirtieth Annual Meeting of the American Gas Light Association, which will be held in this city next week, have been completed. The official notice issued by Secretary Forstall, which has been appearing in the JOURNAL for some weeks, explains fully the programme that is to be followed. The headquarters and meeting hall selected are all that could be desired, although it is possible some will complain that they are both pretty well uptown. However, the convenience and the completeness of the quarters are sufficient to put out of court any complaint on the score of location. The paper list, which we understand is not complete as it stands in the Secretary's notice, seems a trifle spare, but the address of President Beal, who is a man of thoughts as well as deeds, together with the reports of the various committees appointed to consider certain specified matters, even if no other set subjects are presented, will be sufficient to guarantee the success of the meeting from a technical standpoint. The entertainment proposed and arranged for is of a high order, and a feature thereof will be the part to be taken by the Consolidated Gas Company. A large accession to the membership is assured; in fact, it would not surprise us if 50 names at least were put in for election. From the news we receive respecting the probable attendance, we have no hesitation whatever in predicting that Mr. Beal will preside over the deliberations of the greatest number that ever took part at a meeting of the Association.

DEATH OF MR. S. MILO DOLE.—With great regret we announce the death of Mr. S. Milo Dole, whose demise occured at his home, 14 East Front street, Adrian, Mich., the afternoon of September 24th. Deceased was born in Ogden, Mich., October 2, 1865, and in his early life was connected with newspapers, in Detroit and Adrian, in a mechanical way. In 1892 he accepted a position as bookkeeper for the Adrian Gas Company, and successfully served it in several positions. He was its Manager at the time of his death, and to his well directed efforts much of the Company's prosperity is due. He was prominent in the affairs of the Michigan Gas Association, of which body he was elected Vice-President this year, and was also an active member of the Ohio Gas Light Association.

NOTES.—

THE plant and franchises of the Sharpsburg and Etna Gas Company, been practically shut down for several months, the competition with the of Sharpsburg, Pa., are soon to be sold at receiver's sale. The works have natural gas suppliers having been so severe that it was impossible to continue longer a losing struggle.

WHEN it became known to the office staff and works' force of the Dallas (Tex.) Gas and Fuel Company, that its Secretary and Superintendent, Mr. Thomas D. Miller, had resigned those positions, to assume the Managership of the New Orleans Lighting Company, the men determined that the executive officer who had, in all fairness and sincerity, directed their duties for something over 10 years, should not leave them without experiencing proof that his ways with them had been appreciated. On the afternoon of Wednesday, the 24th ult., Mr. Miller was asked to step into the counting room of the Company. On entering he found there assembled about the entire staff of the office and works. Before he had thoroughly comprehended the situation a spokesman, on behalf of the office staff, stepped forward and, after a few clever words, asked Mr. Miller to accept a testestimonial of their regard for the way in which he "mastered" them. The testimonial was a solid gold locket, on which was mounted an elk's head, beautifully set in diamonds—Mr. Miller is a prominent member of the "B. P. O. E." order. The first spokesman had but finished his speech when another, representing the works' force, handed to Mr. Miller an ivoryhandled umbrella, the mounting being of artistically arranged silver. The retiring Manager, in the manner that he knows so well to follow, thanked his friends and fellow workers for their kind remembrances of him, and assured them that he appreciated thoroughly the work that while under him they had done so well for the Company and its owners.

MR. JAMES N. YOUNG has reconsidered his determination to succeed Mr. Miller at Dallas. He will remain in the service of the Joplin (Mo.) Company.

THE town of Oyster Bay (the home of President Roosevelt) is to have a gas supply.

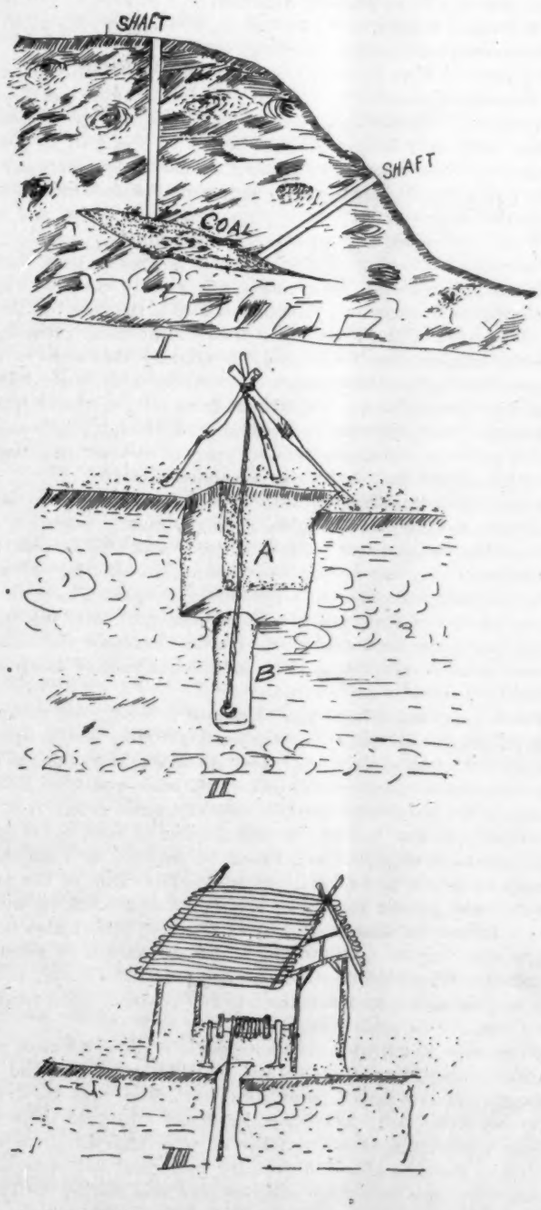
THE stokers and other skilled hands employed by the New Haven (Conn.) Gas Light Company have petitioned for an increase in pay from 22½ cents to 25 cents per hour. An answer to their petition was to have been given last Saturday.

[Prepared for the JOURNAL.]

Coal Beds of Cebu and Masbate: Processes of Getting the Product.

By a SOLDIER.

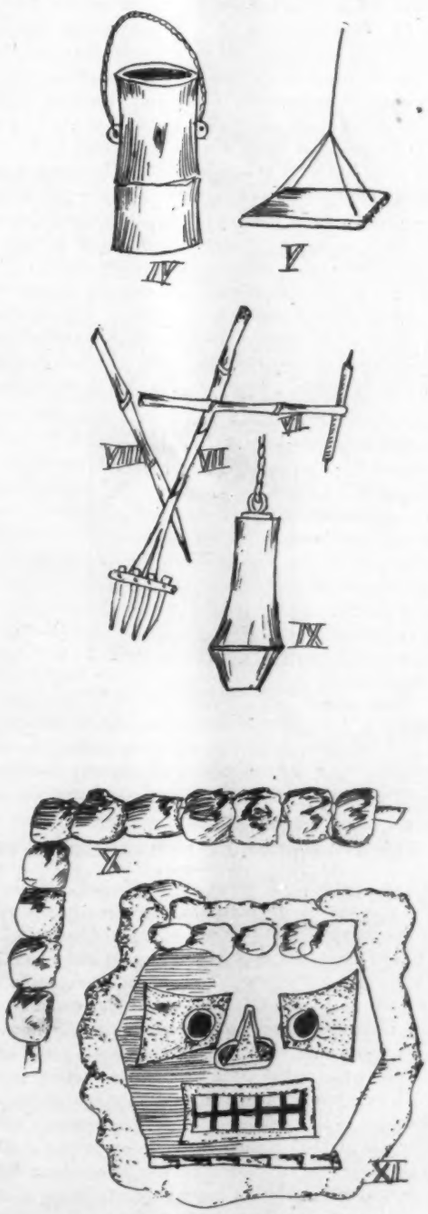
The coal beds of Cebu and Masbate, of the Philippine Archipelago, have been attracting the attention of capitalists for some months past, and the indications are that in a short time these mines will be operated. The Spanish and the natives, as well as some of the Chinese of olden times, have operated in the coal producing sections of these portions of the islands, but always with indefinite results, owing to the crudeness of both implements and methods. The workmen at the mines would often cease work suddenly, deserting the shafts, permitting them to overrun with water and general debris, thus losing much of the headway previously made. In this way many losses accrued to the operators and discouragements were frequent. These beds of coal, however, have been and can be again rendered profitable to work. The coal is of good enough grade to warrant working, and has been utilized satisfactorily in many places. Engineers have long since surveyed the coal beds of this part of the country, and they have discovered that the Masbate beds are, near the beaches, tilted from about 70 inches with the horizon. The yield has been about 20,000 tons of lignite under the native workings each year. It would be natural to expect an exceedingly small output with the crude devices employed by the mining operators in working these beds. With improved devices and processes the figures would, of course, total up differently.



Showing Operations in Getting Lignite in Cebu and Masbate.

The Plan of the Beds.—Your correspondent secured sketches of the plans of the lignite beds, and in Fig. I. gives a sectional view of same. The deposits are usually in strata some distance below the surface of the earth, and are found by the natives boring into the ground with hand-made drills, removing the earth as fast as it is loosened. Buckets and wood bamboo tubes are used for this purpose. Often these natives cut holes of great depth and manage to plaster the walls in such way with cement like preparations that lumber is not needed to brace with. These excavations frequently cave in, but the loss of one or more of the native workmen in the bottom of the shaft does not appear to concern the fellow workmen very greatly. The custom has been to bore straight down to the layer of lignite and when this is located other shafts are sunk, some of them extending inward from the side of the hill as shown in the view. Thus coal may be extracted by chipping from the base deposit and carried in pieces in tubes of wood or in baskets to one of the outlets. Some of these shafts are stoned up and used for years. It seems to be a custom to work portions of the beds when the desire comes to the proprietors, meanwhile the mines are permitted to remain idle and the shafts become flooded.

Surface Well Idea Used.—The plan of using a surface well has been adopted in many of the lignite working sections. The idea is followed on the lines set forth in Fig. II., in which the surface well proper is indicated at *A*, and the boring to the lignite deposits at *B*. A derrick or tripod devise of bamboo poles is set up and adjusted above the surface well, and the proper hemp ropes thrown over for lifting and lowering



Some of the Coal Workers' Implements.

the boring tools and the buckets containing the coals or debris. Several native hands are required to operate this crude contrivance.

With Windlass and Rope.—The more advanced workers use the wood cylinder idea, on the plan of the windlass, as shown in Fig. III. A large wood cylinder is arranged to revolve on heavy wood shafts in a frame of lumber set up directly above the shafts. Then the proper cranks are fitted to the ends of the shaft of the cylinder, and four men turn these cranks. The necessary ropage is used for lifting and lowering the devices from the shaft. This arrangement is further improved by having the affair roofed, thus keeping rains from pouring into the open shaft and also affording protection for the workmen at the cranks.

Devices.—We next call attention to some of the odd devices used by the workmen in operating these lignite beds. In Fig. IV. is shown the type of bamboo tube bucket used for lifting deposits from the base of the shafts. A rope handle is furnished, which handle is fixed to the rope or hook of the windlass device and the affair is quickly hauled to the surface when filled. Sometimes a mere flat board is used for this work, fitted with ropes at each corner, as in Fig. V. These devices frequently slant considerably and the coals roll off.

Work Tools.—Fig. VI. is a common kind of native pick, made with hardwood pieces, the points of the portion forming the pick being fitted with pins of metal. It is a feeble affair and has to be handled with delicacy. Fig. VII. shows one of the native forks which is used for moving debris and working coals loose and in varied work in the shaft. Fig. VIII. is a common, straight piece of bamboo rod with a metal point fixed thereon. This is the bar used by the workmen for loosening particles. Fig. IX. shows the type of crude boring tools seen in service. The device is metal and the lower end is hollowed, leaving, therefore, a circular, flanged cutting edge, which edge is brought to play upon the base earth of the shaft by repeatedly lifting and dropping the tool by means of a rope. Sometimes the natives lift and drop the tool by main strength, while again one sees that wood wheels, ropes and levers of crude make-up are used to do the work mechanically. The earth is partly loosened by the cutting edges of the tool and is removed in buckets.

Black Diamonds.—The natives are not backward about producing designs in the black nuggets. These natives are, as a rule, a lazy lot, but they often do considerable apparently needless work. They will devote the 2 hours' rest at noon occasionally to making queer ornaments from little black pieces of coal picked up by them. For example, in Fig. X. is shown a specimen of some of the little black diamonds of lignite, bored through laboriously and strung like beads. This makes a chain or necklace which may be worn. Again, in Fig. XI. is shown one of the pieces

Some Armed Natives at the Mines.

of sculptor work of a native at the mines. He devoted many noon hours to cutting and chipping this headpiece from a piece of lignite. The teeth were formed to give a hideous effect, as shown; likewise the eyes and other features. This ornament appeared to interest the natives.

The Production of Natural Gas in 1901.

According to the annual report of the United States Geological Survey on the production of natural gas, recently completed by F. H. Oliphant, the value of this product consumed in the United States in 1901 was $27,067,500, representing approximately 169,172,000,000 cubic feet at 15 cents per 1,000 feet. This is an increase in value over the product of 1900 of $3,368,826. Although the consumption of natural gas steadily increases, the pressure, except in the new fields of West Virginia, has continued to decline, necessitating the expense of compression in order to market an increased production from the declining fields, which expense must continue to enhance as the pressure declines and the distance to the source of supply increases. There was an important increase in 1900 in the number of iron and steel works employing natural gas as fuel, the total having risen from 83 such establishments in 1900 to 102 in 1901, a large majority being located in Pennsylvania.

During the year 1901 there was an unusual amount of consolidation of the older companies marketing natural gas, and there were organized also a number of new companies with large capital, with a view, chiefly, of utilizing the great areas of high pressure gas territory in Lewis, Harrison, Marion and Wetzel counties of West Virginia, by the construction of larger and longer pipe lines, so as to market this increased production in Western Pennsylvania and Ohio. This involves an outlay of many millions of capital.

As a source of heat, light and power, natural gas is unexcelled from the moment it reaches the surface of the earth at the mouth of the well until it reaches the furthest consumer at the end of the pipe line. No preparation is necessary for its combustion, and no residue is left. It needs only to be mixed with the proper amount of oxygen. These are the facts that have stimulated capitalists to invest the money necessary to develop the reservoirs of the natural gas fields that are still holding their original pressure and volume. These capitalist are building hundreds of miles of larger lines in order to supply the towns and cities formerly supplied by nearer but now exhausted fields, and also to supply other cities that have never known the blessings of natural gas.

It has been supplying the power for a very large number of factories and operations in the gas belt, and lately it has been extensively applied in creating the power by which the natural gas itself is compressed from a low to a high pressure when the original pressure has failed and the pipes are insufficient to deliver the necessary quantity of gas at the well pressure. A number of these compressors work up very close to 1,000-horse power, with an economy that enables 8 to 10 cubic feet of natural gas to develop a horse power for an hour, a saving of from 40 to 50 per cent. over high duty steam engines.

The State of West Virginia has for several years furnished an increasing quantity of natural gas to Pennsylvania and Ohio; yet there still remain under the domes and arches of its rugged hills great reservoirs of it that have only been sufficiently tested by the drill to prove their existence. These reservoirs are being connected by additional lines of large pipe and will shortly supply larger quantities to localities in these States that have exhausted their own nearer reservoirs, and now turn to West Virginia for a continuation of their supply.

The value of the natural gas in 1901 was greater than that of any previous year, though the quantity was greatly exceeded when it was first introduced extensively from about 1883 to the close of 1889. During this period of six years it was used in the most extravagant and reckless manner, and it was paid for at rates that were in many instances less than one-half the price of the equivalent coal. Large quantities were allowed to escape and burn from the mouths of hundreds of standpipes from Saturday afternoon until Monday morning. It is highly probable that in the these six years of reckless consumption four times the present production was consumed annually.

As the visible supply grew less the value became more apparent, and the appliances for consuming the gas were greatly improved after the introduction of the meter. The pipe line companies adopted more advanced methods, in securing better joints, in shutting off wells that were not needed to keep up the pressure in the mains, and in manipulating the wells themselves. By the extension of lines into newer territory they have been enabled to market increased quantities at enhanced prices since the years 1895 and 1896, in each of which years only $13,000,000 worth of gas was sold.

The value of the natural gas consumed in the United States in 1901 was $27,067,500, which, at 15 cents per 1,000 cubic feet, is equivalent to 169,172,000,000 cubic feet. If it were possible to store this gas in a cube, the density throughout being equal, its sides would be 5,530 feet in length or 250 feet greater than the sides of a cubic mile. If 20,000 cubic feet of natural gas be taken to equal 1 ton of coal, 8,458,600 tons of coal, valued at $3.20 per ton, would be required to yield the sum of money for which the natural gas sold. The value of the production for 1901 was greater than that of 1900 by $3,368,826, or over 14 per cent. It exceeded that of 1899 by $6,992,627. It may also be interesting to note that the value of the 69,389,194 barrels of petroleum produced in the United States during 1901 was $66,417,335, and that the value of the natural gas amounted to 40.7 per cent. of the value of the petroleum for the same year.

There were 10,293 wells producing natural gas at the close of 1901, of which number 74 were not turned into the gas mains, and 2,088 producing wells were drilled in the same year; there were 453 dry holes, or non-producers, and 1,084 were abandoned. In 1900 there were 9,738 producing wells, of which number 24 were shut in; 1,759 wells were drilled in the same year, 359 were dry holes and 991 were abandoned. There were very nearly 800 miles of pipe laid during 1901, the mains varying from 2 up to 20 inches. This brought the total up to 21,848

miles of natural gas mains of from 2 to 36 inches in diameter in use at the close of 1901.

The increase in the value of the output of natural gas in 1901 is due principally to increased production, the advance in the general price being very slight, and is not due so much to the output from the recently developed fields in Southwestern Pennsylvania and Central West Virginia as to the enlarging of lines and the installation of gas compressors. It is this that has kept up the quantity marketed in Indiana to about the average of former years, although the rock pressure has very largely decreased. Kansas, however, has increased the value of natural gas marketed both by developing new territory and by exploiting more thoroughly that which was already known. The following figures show the output of natural gas in 1901 by States: California, $67,692; Colorado, $1,800; Illinois, $1,825; Indiana, $6,954,566; Kansas, $659,173; Kentucky, $270,871; Missouri, $1,328; New York, $293,232; Ohio, $2,147,215; Pennsylvania, $12,688,161; Texas, $7,255; South Dakota, $20,000; West Virginia, $3,954,472; total, $27,067,500.

Notwithstanding all the care exercised in the collection and distribution of the statistics, there is a very considerable amount of natural gas consumed of which no account is rendered, as it is used universally in the oil fields for pumping wells, both in the gas engine and under the boilers, for driving gas compressors and for supplying farm houses and many operators in the field. There are instances, which reach from northern Central New York to Eastern Illinois, where single wells supply one or two houses, so that if it were possible to secure a complete return of the value of all the fuel displaced the figures presented would be increased by at least 10 per cent.

A total of 5,742 manufacturing establishments employed gas as fuel during 1901, of which 102 were iron and steel works, 219 glass works, and 5,421 engaged in other industries.

Massachusetts Statistics of Electrical Supply.

By Mr. Alton D. Adams, in *Electrical World.*

In the early days of lighting from central stations Massachusetts began to collect statistics of the industry, and it remains the only State that publishes comprehensive data of electrical supply.

Massachusetts has constantly been a leader in the distribution of electrical energy. The peculiar value of its records, therefore, is not only that they began early and are complete, but also that they represent substantially, in kind, the development of electrical supply throughout the United States.

Commissioners were given general supervision of all corporations and persons manufacturing and selling electric light in Massachusetts, by Chapter 382, Acts of 1887, approved June 8 of that year. This law required every electric light company to make a return annually to the commissioners in a form and at a time prescribed by them. In this return the amount of capital and indebtedness on the 1st day of January preceding were required to be stated, also the income, expenses and dividends declared or paid by the company during the preceding year. A list of all salaried officers and the amount annually paid to each were also required, and the return must be sworn to by the president and treasurer of the company and by a majority of its directors.

Besides this annual report, the law requires each company at all times on request of the commissioners to furnish any information concerning its condition, management and operation. Each company must keep an office in the city or town where its works are located, and at this office must be all books required by law to be kept within the Commonwealth, including books to show receipts, expenses and indebtedness of the company. These books must be open to the inspection of the commissioners at all times. Any court having jurisdiction in equity may on application of the commissioners enforce the foregoing requirements by a suitable decree in equity.

The first annual reports of electric light companies under this law were required to be for the year ending June 30, 1888. For neglect to make the annual return required by law of each electric light company a forfeit of $5 per day during the first 15 days, $10 per day during the second 15 days, and not more than $15 per day thereafter, from the second Wednesday of September in any year was imposed by Chapter 363, Acts of 1892. This act further provides a forfeiture of not more than $500 for final neglect or refusal to make the annual return in each case.

Beginning with the 1st day of July, 1896, every person and corporation engaged in the manufacture and sale of electricity was required to keep such records of the operations of its plant as the commissioners might require, by Chapters 356 and 480, Acts of 1896. Chapter 426 of the same year authorized the supreme judicial court to enforce orders of the commissioners by appropriate process in equity.

This series of legislative acts has not only given the commissioners ample authority to collect complete data concerning electrical supply, but has put the entire machinery of courts of law and equity at the disposal of the commissioners to enforce their orders and demands.

Acting under the legislation of 1887, the commissioners at once proceeded to collect statistics relating to the equipments and operations as well as to the financial condition of the companies engaged in electrical supply.

The act creating the electric light commissioners requires them to make annual reports to the Legislature, giving abstracts of the data collected from the electric companies. The first of these annual reports was made for the year ending June 30, 1888, and they have been continued yearly up to the present time. Under the Act of 1887, the commissioners had authority to ask and the electric companies were required to give any desired information concerning the technical as well as the financial side of the business, but the requirement to keep books extended only to the financial side. It thus came about that companies could not in all cases give data asked for by the commissioners, because there were no records. This state of affairs led to the Act of 1896, by which the companies came under the duty to record all operations and outputs of their plants and systems according to forms prescribed by the commissioners.

By this last named act the commissioners are put into a position to find out all that any of the companies or their officers know about the electrical supply business.

In general the electric lighting companies have readily complied with the requirements of the commissioners, and in the few instances where this has not been true the heavy fines for delay and the equity jurisdiction of the courts have proved to be ample remedies. Concerning the accuracy of reports made by the electric lighting companies to the commissioners, it is not to be presumed that the president, treasurer and the majority of a board of directors of a corporation engaged in electrical supply will incur the penalties of perjury by knowingly swearing to a false return. Moreover, the mass of data in the hands of the commissioners is now so great, its records of each company through a series of years so complete, and its power of inspection of all company records so unlimited, that any serious misstatement as to the finances or operations of a company are almost sure to be quickly detected.

While the commissioners have included in each of their annual reports a large mass of statistics relative to the equipments and technical operations of the electric companies, the legislation of 1896 concerning the form of records to be kept on these subjects has tended to make subsequent reports more complete. Discretion as to what portion of the data obtained from the electric companies shall appear in the annual reports of the commissioners rests with them, and not all of the statistics collected by them have been published. A notable illustration of this policy relates to the kw hours delivered at switchboards and to consumers by the companies. The commissioners collect this information as to energy developed and sold, but do not publish it. In order to secure complete and uniform reports from the companies engaged in electrical supply, the commissioners have from the beginning issued to each company yearly a book of printed, numbered questions, with blank spaces thereafter for the answers. These printed forms are sent in duplicate to each company, one copy to be retained by the company and the other to be returned to the commissioners. The first set of these forms was issued to the companies under date of June 28, 1888, and the reports were returnable, for the year ending June 30, 1888, not later than September 12 of that year.

In these first forms the financial affairs of the companies were arranged under five separate schedules. The first schedule related to capital, debts and cost of plant, and contained 23 distinct items to be filled in. In the second schedule were included expenses of operation with 26 items and money incomes with 10 to 13 items. The third schedule was devoted to the profit and loss account in which was included, besides, the results of operation, the items of interest, depreciation, reserve funds and surplus. Assets separated under 22 items and liabilities under 10 items formed the subjects of the fourth schedule. Particulars of the reserve fund under 9 items made up the fifth schedule.

Technical details of equipment and operation were covered at length in these forms. The location of plant, area of land, size and construction of buildings, and whether owned or leased, were required to be stated. In the case of boilers, engines and water wheels, the number, capacity and description of each was to be stated. The make, type, number and capacity of dynamos was required. Arc and incandescent lamps were specified according to number and candle power of each. Motors were

arranged with reference to their numbers, capacity, type and voltage. Distribution circuits were designated as to their lengths and the sort of service rendered by them. Numbers of poles, lengths of underground conduit and the feet of wire carried by each were included.

The items of operation at stations included the kinds and quantities of fuel consumed. Numbers of public and commercial arc and incandescent lamps operated, and the candle powers of each were required to be stated. For street lamps the number of hours of operation per night and the nights per month were to be included. The general schedule of prices for commercial service and the contract rates for street lighting formed items in the report. In addition to these stated, many minor matters went to make up the technical data required by the commissioners of each company. This printed form with a specific answer to each question made up the report to which the president, treasurer and a majority of the board of directors of each company was required to certify under oath.

Since the date of the first reports just considered, the general nature of the data required by the commissioners has remained about the same, but the number of separate items covered and the decree of detail as to the different branches of the business have been materially extended.

Thus, in the reports of 1901, the cost of plant included 32 items, operating expenses 31 items, and the technical statistics of equipment and operation were largely increased. A list of the numbers, lengths, size of conductors, kind of energy supplied, and the lamps or motors to which service is rendered must now be stated for each circuit. The list of transformers must now include the number and capacity of each, and the date when installed. Electric meters are reported as numbers, capacities and additions. Storage batteries are described as to make, number of cells, number of plates per cell, voltage per cell and the discharge rate of each battery at 1, 5 and 10 hours. The records now required of energy outputs include the kw-hours from each type of dynamos delivered at the switchboard and sold to consumers, also the kw-hours sold for lighting and for power.

As recorded for each year the data of these reports necessarily presents the dry, statistical form. When the reports are separated into distinct parts, arranged in chronological order and analyzed, they offer, at once, the best available record of the past development and of the present condition of electrical supply in the United States.

Massachusetts, through its commissioners, has performed a great service for electrical interests and the public at large, in the preservation of this unique record of the rise of the central station industry.

Relative Attractiveness of Different Artificial Lights.[1]

There can be no questioning the fact, which is subject to common observation, that present-day practice in the art of artificial illumination exhibits considerable advance upon that of even a very few years ago. This result is chiefly due to the increased prominence that modern industrial developments in the lighting trades have given to the various improved methods of artificial lighting actually in the market. In times when the only choice lay between the flat-flame gas burner and the mineral oil lamp of a similar class, there was nothing to arouse particular interest in the subject of lighting on the part of the general public. Where gas was to be had, and came within the means of the possible consumer, it was chosen as a matter of course. The reason for this preference is quite well worth distinguishing and considering with reference to actual conditions. It was, mainly, the greater convenience, saving of labor and trouble, and safety of gas as compared with its only alternative. There was really no comparison between gas and oil lamps in these regards, to which reason is to be ascribed the large business that was done for many years in the provision of private gas works for mills, factories, and large country houses. If this consideration is steadfastly kept in mind, while reviewing the existing practice of lighting, it immediately appears that whereas in some methods of lighting for which much is claimed by way of brilliancy, cheapness, or other positive advantage, the master element of convenience is left out of sight, in other cases it forms, far more than is commonly recognized, the ruling recommendation which outweighs obvious drawbacks.

Let us first of all briefly discuss some of these other aspects of modern artificial lights. It is now some years since the common mineral oil lamp was greatly improved in sightliness and brilliancy, to the slow but sure displacement of the older "Moderator" colza oil lamps, which, in the middle Victorian era, no self respecting domestic establishment could do without. The novels of the period are sprinkled with appreciative descriptions of the softness of the shaded lamp light which ruled in drawing room and study, and the effect was not seldom contrasted with the "garish" gas light of public places of resort and entertainment. The blame for this relative disparagement of the more popular and brighter illuminant was chiefly due to the gasfitters, who, following what seems to be the common tendency of the last comers into the lighting business, failed to understand much that was unexpressed in the taste of their public. Electricians made the same error in their turn. Consequently, artistically shaded and diffused gas light was not much in evidence in those days, except in France, where the stronger artistic temperament of the people showed itself in the general employment with gas flames of white "opal" globes, although these necessitated the consumption of more gas. It is strange, nowadays, to look back to this period, and mark how utterly unable those who testified to the fact were to perceive and give the reason for the "better gas lighting" of Paris than of any English town.

It is impossible as it would be ungrateful to omit mention in this connection of the name of William Sugg, who first, with his "Christiana" type of shade globes, set up the correct standard, both of taste and efficiency, in interior gas lighting. There is nothing better to this day for the purpose. Meanwhile, gas lighting in general lost nothing by the improvement of oil lamps already mentioned. The introduction of the round wick oil lamps, which remains the highest achievement of invention in this field, while placing oil lighting on a parity of illuminating effect with flat-flame or Argand gas burners, left untouched the considerations of convenience, labor and safety, which, therefore, still turn heavily against every kind of oil lamp. Even if the incessant endeavors of late years to make the incandescent oil lamp a rival of incandescent gas had succeeded, this advance would have still left the method of lighting as troublesome, dirty and relatively inconvenient a system as it ever was. There is something almost pathetic in the efforts made to adapt oil to the principle of a truly distributed illuminant, of which gas was the first example. The nature of the thing is against such a development. Oil lamps, by whatsoever means they shine, must remain in the portable order of lights, and make the most of the advantages, such as they are—and they are by no means insignificant—of this quality.

It is a familiar observation that as civilization advances, people grow increasingly averse to taking unnecessary pains in their own affairs. Our predecessors, with more or less willingness—for they knew no other way—did many more things for themselves than we are content to do. Our remote ancestors had to go out and catch their hare before they could think about cooking it; whereas we abuse the government because every householder cannot as yet order his meat from the butcher by private telephone. Down to recent years nobody regarded it as a hardship to have to strike a match and light the gas. Those who did this, perhaps several times a day, if they thought of the nature of the action at all, would probably congratulate themselves upon not having to painfully hammer out a spark with flint and steel in order to get a tallow dip alight, as their fathers were fain to do. But now, even the necessity for lighting the gas is voted a tax upon strength, time and patience, and a positive drawback to the recommendations of gas. People will pay handsomely, more especially if they are not instantly reminded of the charge, to be saved the smallest trouble. It is through overlooking this element of the situation that professed economists are so often led to form wrong conclusions in regard to the turn of trades and public supply organizations. The economist is apt to overrate mere cheapness as an attraction in itself. All other things being equal, it is usually true that mankind will try to get the most they can for money; but, then, so few things are really of equal desirability, but different prices, that the rule becomes as idle in practice as the famous lesson of Buridan's Ass.

It was a reasonable doubt as to the willingness of the public to take any additional trouble about their lights—especially about gas, the chief recommendation of which was that it gave no trouble at all—which caused most gas engineers to look askance at the Welsbach light. That, and nothing else, was the origin of the indifference of the leaders of the gas industry in this country to the novelty, which was so grievously misunderstood by the Welsbach Company. We all know what was their idea on the subject, and how costly the mistake eventually proved. It is idle to inquire why, in the circumstances, British gas companies did not immediately rise to an appreciation of the right way of overcoming this objection to the Welsbach system. If the original Welsbach Directors went to their (financial) graves firmly persuaded of the incompatibility of their interest with that of gas suppliers, the latter might have believed as strongly that the public, who have never even in many instances arrived at an understanding of the gas meter and its ways, would not take kindly to a burner of their recommending. Besides, in this country the Welsbach burner was an expensive affair, and trafficking in it was surrounded with such difficulties that the most fa

1. *Journal of Gas Lighting.*

sighted of gas company administrators was easier persuaded that it was a thing to be left alone than to be unnecessarily meddled with.

In Germany, as all the world now knows, altogether different conditions prevailed. Not only was gas itself much dearer than in England—thus heightening the initial attraction of an economical means of obtaining light from it—but the Welsbach invention was marketed without any irritating restrictions or artificial enhancement of price. Therefore—not immediately, but after a sufficient period of probation which everything helped to shorten—the gas manufacturers not only saw that the method was likely to prove lastingly beneficial to their customers and to themselves, but also that it was subject to the one great drawback of giving additional trouble, already admitted. Naturally, as business men, they set about the removal of this obstacle to the universal popularity of the system; and the result is the "maintenance" arrangement as we now have it. What we are at present solicitous to make clear in this connection is the true magnitude of the new departure, in its essential quality of a concession to the universal sentiment of civilized humanity. It is no mere "fad" of a few enthusiasts for a particular method of popularizing gas, but of a piece with that overmastering tendency of sparing the community unnecessary trouble and labor, which has brought about the installation of lifts in places of business, and finds profit in halfpenny tram fares.

Even so, the gas manufacturer is beaten on the point of convenience by his electrical rival. The superiority which gas holds to oil, has been taken in its regard by the electric light. There is no sense in ignoring this patent fact, though, to judge by the insensate claim of electricians to cheapness for their light, one would imagine them to be bent on minimizing its strongest point, in order to attach themselves to its weakest.

The cheapness of electric light, and the profit to be made out of supplying it even in the poorest districts, have been insisted upon by partisans of the light from Sir William Preece downwards, until one would imagine they half believe it themselves; while scarcely one of these advocates of the light of luxury has made enough of its real and incomparable advantage of convenience. Indeed, one of the main factors in this very consideration—the facility of turning on and off the electric light in a room from a switch beside the door—has been abused by electricians into an argument for its economy. It is stated to be such a "saving" to be able to turn on and off the light in this way.

The fact being, that while those who can afford the light at all do not care a jot whether they can save little or much by this arrangement, they do appreciate very highly the advantage of being able to "light up" in so simple and handy a fashion. And so does every man, even though he be a gas engineer, who has occasion to use electrically lighted hotels when on his travels. It is quite common to find electric lighting superseded by incandescent gas in the public rooms of hotels, on account of the greater brilliancy and economy of the latter, while it is retained for the bedrooms for the sake of its convenience. It is a comfort not to have to fumble for the matches.

Such a division of patronage as this proves our point, and shows how much more carefully than of yore the practical problems of artificial lighting are now studied and solved. It would not have been within the power of the public of a past generation thus to balance brilliancy and price against convenience. It is its convenience, added, of course, to a touch of fashionableness, which keeps a market for electric lighting, notwithstanding the demonstrable superiority of incandescent gas in brilliancy and price; and remembering what the same element once gained for gas in comparison with lamps, it does not lie in the mouths of gas engineers to complain of the change of fashion. If everybody could have the electric light to go to bed by, and switch on at need in the dead of night, everybody would use it for this purpose. But that such a line of custom alone would not pay the supplier is quite another story. We do not suppose it would. That, however, only exemplifies the short-sightedness of those who in this country would not let gas companies do whatever electric lighting their public required—like the Corporation of Leicester, for instance. If gas companies had been allowed a free hand in this matter, there would scarcely have been one such undertaking in the land from which at the present time consumers could not have suited themselves with any proportion of either kind of light they might happen to fancy. The gas company would not have minded if the householder had asked for only two or three electric lamps for his bedrooms, using gas for the rest of the honse. How does it stand now? All the ingenuity of the electrical profession is exhausted in inducing the consumer to use his lamps for the longest possible period of every evening—which is to make electricity look at its very worst beside gas. And even then the business does not often pay. A gas company would have supplied a consumer with electric light for half an hour, or an hour of an evening, for "upstairs" use, saying nothing about maximum demand indicators or any other vain device for making a costly luxury appear a cheap necessary. The gas company would probably charge the maximum rate for it, too; but seeing the limited and special character of the demand, that could not be an objection. And inasmuch as the supply would be provided by the engineman on night duty starting another machine, driven by gas or steam, it would be cheap enough to the company. It is almost a pity that, even as the law stands, an attempt to work a small combination of this kind has not been made. We say a "small" works advisedly; for no English gas company would care to burden themselves to no advantage, with a branch business big enough to stand alone. It is only a question of such small districts as must go without the convenience of the electric light altogether, if it is not to be had from the gas works.

Desulphurizing Process for Coal before Coking.

Mr. Oscar Daube, writing in *Engineering and Mining Journal* on this topic, says that a difficulty in the production of good metallurgical coke is frequently the high percentage of sulphur in coal that would otherwise make an ideal coke. Many efforts have been made to eliminate this objectionable element, and have been unsuccessful, particularly where the sulphur occurs in organic combination.

Results of tests recently made for the Dominion Iron and Steel Company in connection with the Otto-Hoffman by-product coke ovens at Sydney, having for its object the reduction of sulphur in the coal, are of interest. It is well known that all Cape Breton coals carry an excess of sulphur, running on an average about 2½ per cent. It is otherwise a fair coking coal, although from being somewhat high in volatile matter the coke is porous and does not bear well in large modern furnaces.

An average analysis of unwashed coal shows: Carbon, 75.10 per cent.; ash, 5.84; sulphur, 2.75. The sulphur by washing is reduced to about 1.35 to 1.50 per cent., and the resulting coke generally runs from 0 10 to 0.15 per cent. higher than the coal, showing that no material reduction of sulphur in the coking occurs after washing the coal.

These observations and figures were obtained from the Dominion Iron and Steel Company, but it may be stated that coal from the same seam washed and supplied to the New England Gas and Coke Company, Everett, Mass., and coked in the same type of oven, runs on an average 2.5 per cent. sulphur in the coal and 2.25 per cent. in the coke.

The average yield of coke in 8 consecutive days was 67 per cent. coke, 7 per cent. breeze, the coke showing an average of 78.96 per cent. carbon and 1.44 per cent. sulphur, as follows:

Carbon.	Sulphur.
75.80	1.33
76.87	1.59
80.82	1.67
83.16	1.39
79.39	1.46
75.20	1.23
78.24	1.53
Average 78.96 per cent.	Average 1.44

These figures are given in order that they may be compared with results obtained after the desulphurization process was applied. In the first test a charge of 12,300 pounds of coal was used. Half of the coal was washed and half unwashed. The charge as mixed contained 1.66 per cent S. The time occupied in the process was 1 hour and 10 minutes. After desulphurizing the charge was coked, yielding 67 per cent. coke and 2½ per cent. breeze. Analysis of the coke showed carbon 89.25 per cent.; volatile matter, 3.7 per cent.; sulphur, 1.27 per cent., indicating a reduction of 0.39 per cent. in the sulphur contents. A second test was made with 12,600 pounds of wet coal containing 9.4 per cent. moisture and 1.74 per cent. S. The resultant coke (72.5 per cent. yield) contained carbon, 87.6 per cent.; volatile matter, 4.4 per cent.; sulphur, 1.28 per cent.; showing a reduction of 0.46 per cent. in the sulphur contents.

The tests were made without any change in the ovens, and after desulphurizing the charge was coked as under ordinary conditions.

The desulphurizing process does away with the expensive washing plant and avoids loss in coal and the charging of wet coal into the hot ovens. It also prevents the dilution of the gas liquor by the moisure in the coal coming over as condensed steam from the oven into the condenser.

The Heating of Toothed Core Armatures.

By Mr. Fred. W. Davies, in *Electrician*.

Doubtless, there are many electrical engineers who have stumbled across armatures of the toothed core type in dynamos and continuous current motors—especially in the latter—which heated more than their output and dimensions would lead one to expect. It is evident that the designers and manufacturers of these machines did not anticipate this overheating, otherwise the defect would not have occurred. The reason why such excessive heating occurs appears sometimes to be rather obscure, and it will not be out of place to devote a little time to the investigation of the phenomenon. As (in a well designed machine) it is the heating of the armature that limits the output, it is obviously of importance that its temperature rise at full load should be as low as possible. Any reduction of the temperature rise will, of course, increase the permissible output of the machine.

Alongside of such machines there is a host of excellent ones—excellent as regards efficiency, sparkless commutation and cool running; and these are ample evidence that the question of dynamo and motor design is one that has not been studied in vain. Indeed, it may appear to some to be an impertinence, at the present time, to raise the question of armature heating at all, so thoroughly is it understood by the electrical engineers of our time. However, as already pointed out, whilst many of the machines which are now being turned out are excellent in all respects, yet there are some which certainly do not merit the use of this adjective. This being so, it will be well to consider the question of armature heating—a point in which the performance of some machines falls short of that of others. Not so much with the idea of discovering a hitherto unknown source of loss—that would be presumption, considering the advanced state of knowledge on the subject—but rather with the view of emphasizing the importance of certain losses, and pointing out in what way these losses are influenced by the general design of the machine—such is the purport of the present article.

Observations made by the writer on various machines having toothed core armatures which heated unduly, have demonstrated the following facts: First, that such overheating is more marked in machines of the multipolar than the bipolar type, especially in the smaller sizes; and secondly, that the temperature rise is not at all proportional to the load on the machine, but is more marked at light load than at full load. Now, in order to discover the root of the evil, it is necessary to analyze the possible causes of the heating of an armature. There are three principal sources of loss of energy (and, consequently, of heating) in a continuous current armature. They are the C^2R loss, the hysteresis loss, and the loss due to eddy currents in the core stampings. In addition to the foregoing, there are also the loss due to the "short circuiting" of each coil or section of the armature whilst its corresponding commutator bars are under the brush, and the loss due to eddy currents in the active conductors themselves. Unless the design of the machine is an abnormal one, these latter will be quite negligible, and may be safely ignored as far as the present inquiry is concerned the loss due to eddy currents in the conductors, in particular, being always very small, and in the case of toothed core armatures (with which we are concerned at present) practically nil. The abnormal temperature rise of the armature at light load serves to show that the C^2R loss plays but a small part in the matter.

The magnetic induction in the armature core proper is never very high, and would certainly not be likely to cause overheating of the armature—unless the stampings were of inferior quality. This, and the fact that it is in toothed cores that such cases of heating usually occur, point to the teeth as being the seat of the trouble. Armature teeth are frequently made narrow with the idea of minimizing the armature reaction, and consequently, the sparking of the brushes. This plan has little to recommend it, for it increases the hysteresis and eddy current losses, and thus lowers the efficiency of the machine, besides involving extra care in punching out the core disks. The armature reaction may be reduced equally well by increasing the length of the air gap—an expedient which has none of the disadvantages attendant on reducing the section of the armature teeth. It will not do, of course, to make the teeth indefinitely large, as by so doing the space required for the conductors will be encroached upon, and the self-induction of the armature coils will be increased.

Sometimes it thus occurs that overheating of the armature is brought about by an insufficiency of iron in the teeth. Frequently, however—especially in small machines of the multipolar type, which are usually run at a high speed—it is due to another, not unknown, but often unrecognized cause. The loss by hysteresis varies directly as the number of cycles of magnetization through which the iron passes per second, and the loss by eddy currents varies as the square of the number of cycles of magnetization per second. Clearly, the periodicity must be kept as low as possible, and herein lies one of the advantages of a slow speed machine. But it is not only by means of reducing the speed that the periodicity may be reduced. The periodicity also varies directly as the number of poles there are in the magnet. In order to keep the periodicity low, therefore, it is advisable, as far as other considerations will allow, to have as few magnet poles as possible. Many of the small 4-pole inclosed motors now upon the market would certainly run much cooler if the magnets were of the bipolar type. The high periodicity involved by the use of a large number of magnet poles is a more serious matter than it may perhaps appear to be at first sight, for when the watts lost in hysteresis and eddy currents in the armature stampings amount to from 25 to 50 per cent. of the total armature losses, as they frequently do, it makes quite an appreciable difference in the permissible output of the machine to use a 4-pole magnet instead of a 2-pole one, or a 6-pole magnet instead of a 4-pole. There is no valid objection to multiplying the number of magnet poles in the larger sizes, for in such machines it is usual to run at lower speeds.

There is also another reason why the iron losses are greater the greater the number of poles in a machine for a given speed. In order to insure a sufficient range of sparkless brush movement, the gross polar angle embraced by the poles of the magnet (that is, the sum of the angles embraced by the poles) is made less the greater the number of poles on the magnet. Thus, the polar angle embraced by 1 pole of a 4-pole machine is slightly less than one-half of that embraced by 1 pole of a 2-pole machine, and that embraced by 1 pole of a 6-pole machine is slightly less than two-thirds of that of a 4-pole machine, and so on. To give actual figures, it may be said that the gross polar angle embraced by the poles of a 2-pole machine should be about 280°, whilst that for a 4-pole machine should be about 270°, and for a 6-pole machine 260°. From this it will be seen that the number of teeth embraced by a magnet pole is not exactly in inverse proportion to the number of magnet poles, but is rather less than this—becoming less and less as the number of poles is increased. For this reason the magnetic induction in the teeth becomes greater as the number of poles is increased. This will not matter much if, as should always be the case in the armatures for multipolar machines, the radial depth of the armature core, and consequently, the radial depth of the teeth is proportionately less, for then the teeth will be proportionately wider at the roots.

The foregoing considerations serve to emphasize the necessity for carefully calculating the watts lost in the armature teeth; so that, in the event of these figuring out too high, the design of the machine may be modified before it is put in hand in the works. For the purpose of estimating these losses, it may be mentioned, in passing, that the mean average magnetic induction in the armature teeth may be taken as being equal to that at one-third the distance up the teeth, measured from the roots. As a set-off against the increased losses in this direction which accompany an increase in the number of poles, it may be pointed out that the current density in the conductors (and, therefore, the C^2R loss) is usually less in the larger sizes of machines, in which an increase in the number of poles is permissible.

Experiments With Wet, Medium and Dry Concrete.[1]

Some large blocks of concrete were made in January, 1901, under the direction of Mr. W. H. Parkhurst, M. Am. Soc. C.E., for the purpose of determining the effect of using different amounts of water in mixing on the character of the resulting material. The concrete was mixed by hand on a plank platform adjacent to the molds, the ingredients being measured in a box holding 4.42 cubic feet when full, and the quantities checked after measuring by weighing them. The water was also measured and weighed. The details and results of the experiment were described by Mr. Parkhurst in a paper before the Western Society of Engineers, from which the following notes have been taken; the full paper and discussion were printed in the Society's *Journal* for June, 1902.

The accompanying table gives the general data concerning the three blocks. In the case of the dry block, the endeavor was to employ enough water to make a mealy concrete but not to flush it. No amount of ramming the thin layers would bring water to the surface. With the wet concrete men could not stand on the material to ram it; the mass quaked easily, and the mortar clung to the tamping iron. In the case of the medium block, there was enough water so that the top of each layer was flushed by the tamping, but there was no quaking, and

1. *Engineering Record.*

the mass was always hard. The top surface had enough free water on it to spatter when the tamping was finished. The blocks were left exposed to the sun, rain and snow for several months and then drilled and broken by plug and feather. Dragon Portland cement was used. The sand and gravel were obtained by a washing plant from the Fox river, and the crushed stone was of "medium" size.

Data of Concrete Test Blocks.

Block.	Dry.	Medium.	Wet.
Portland cement, cubic feet	4.42	4.42	4.42
Portland cement, pounds	392	382	382
Sand, cubic feet	8.84	8.84	8.84
Sand, pounds	908	895	908
Gravel, cubic feet	11.05	11.05	11.05
Gravel, pounds	1,104	1,078	1,059
Crushed stone, cubic feet	11.05	11.05	11.05
Crushed stone, pounds	939	915	919
Water, cubic feet	1.81	2.65	3.35
Water, pounds	113	166	209
Vol. concrete, cubic feet	25.31	22.69	22.97
Weight per cubic feet, pounds	136.2	151.5	151.4
Loss of weight per cubic feet during 10 months, pounds	1.7	4.5	5.9

In mixing the concrete, the sand and cement were made into a mortar on which the crushed stone and gravel were spread. The materials were turned over several times by shovels and then placed in the molds, where they were tamped in layers 6 inches thick. The dry mixture was placed in its box in 25 minutes, the medium in 21 minutes and the wet in 23 minutes. The dry concrete required and received the most tamping; the wet concrete required nearly as much time to be placed in the mold because so little could be handled on the shovel. After the blocks were finished the surplus water on those of medium and wet concrete froze; this freezing was of short duration.

The blocks stood for about four months exposed to the weather before they were weighed again. As there was not enough water used in making the dry blocks to permit a finish on the sides or top, the surface could be easily abraded. The gravel and stone came away from the mass quite easily, and the block could not be handled to weigh it without crumbling the edges and top surface. At the end of the 4 months all the blocks were found to have lost in weight, but the loss of the dry block was not due wholly to the same causes as that of the others, owing to this abrasion. The loss at the end of 10 months is given in the table. After the blocks were split, the texture of those of medium and wet concrete were excellent, while that of the dry concrete was poor and not well compacted.

The conclusions drawn by Mr. Parkhurst from his experiments are as follows: 1. A medium concrete, or one that has not enough surplus water to produce quaking while having enough to permit easy and thorough ramming, is most desirable. The specification that the concrete shall not quake in the barrow nor while handling, but that it may be wet enough to quake when heavily rammed, would seem about right for regulating the amount of water to be used. 2. It is probably safer to have an excess than to permit a deficiency of water. Above all, however, it is of the utmost importance that the concrete shall be consolidated thoroughly by ramming.

In the discussion following the presentation of the paper Mr. Finley called attention to another discussion of concrete before the Society in 1896, when Mr. Alfred Noble summarized his opinion as follows: "It thus appears that while there is considerable diversity of opinion as to the exact degree of wetness concrete should have, none of the engineers quoted advise such dry mixtures as are commonly required here. The writer believes that a more homogeneous, a denser and stronger material will be obtained if the concrete is made so wet that the mass will quake after ramming; and, furthermore, that where concrete is to be placed in contracted spaces, as between timbers, it may be with advantage made still wetter, so that it can be pushed into place with the shovel, and, by treading, filling all the spaces solidly, with no important diminution of strength at any point, but stronger as a whole." In commenting on this opinion, Mr. Parkhurst approved Mr. Noble's suggestion of using wet concrete, well rammed, in contracted spaces. If this plan is followed a very much better material is obtained, in his opinion, than where dry concrete is used, which will contain many voids.

Some experiences with concrete mentioned by Mr. Parkhurst are also of interest. In one case certain columns resting on pile foundations were constructed under the head-house of a railroad station. To protect them concrete walls were built connecting one column with the adjacent one between tracks, the walls being 4½ to 5 feet above ground and extending 2 to 3 feet below the surface. As they were built simply for protection, little attention was paid to the foundation. The ground had been solid 3 or 4 years before, but was all dug up when the building was constructed and had not been thoroughly compacted afterward. Crushed granite and limestone were used, with no sand at all in some cases, and a layer of mortar was placed over the walls as soon as possible after the molds were removed and before the concrete had set. The walls developed long, irregular, vertical cracks in many places, which were evidently due to bad foundations and not to internal stresses. They were cut to pieces in places, and the interior was in excellent condition; in all such cases where wet concrete was used the material was found to be very well compacted.

In using concrete in walls Mr. Parkhurst suggests placing the expansion joints from 20 to 30 feet apart. In one wall on the Illinois Central Road there are three concrete sections, making together a length of 100 feet, with pilasters every 33 feet. An artificial joint was made adjacent to each pilaster by putting a septum in the mold and building up to it, then taking it away and building the next section, and repeating the process again. The wall was built while the temperature was 50 to 60°. The temperature sometimes falls to 20 below zero, and in such extreme weather the joints open fully $\frac{1}{8}$ inch. No cracks had been observed elsewhere.

Uncle Sam as a Lamplighter.[1]

Among the many queer occupations followed by Uncle Sam is that of lamplighting. If you could be high overhead late some afternoon, so high that the United States would lie like a map below you, it would be a wonderful and beautiful sight that you would see with the arrival of dusk. It would be just as if some mighty Aladdin had rubbed his lamp and his obedient genii had instantly set flashing stars along all the coasts and the big watercourses of America. If Uncle Sam ever were to become weary or forgetful and were to neglect his lamplighting for just one night or even a few hours in any one night, it might mean the drowning of hundreds, perhaps thousands, of travellers and sailors and the loss of millions of dollars' worth of ships and cargo. For Uncle Sam's lamplighting is the kindling of the flames in more than 1,200 lighthouses, 46 lightships and more than 2,000 buoys and lanterns in harbors and rivers. Uncle Sam lights his lamps in all sorts of ways and in all sorts of places. Some of them are nothing but common lanterns fixed to poles driven deep into the bed of a shoal on the edge of a channel. Others are like machine shops with steam boilers and electric dynomos to kindle a light that shall shine for more than 30 miles out at sea. To help him set them all going at the proper instant each evening Uncle Sam has almost 4,000 assistant lamplighters. Some of them live year in, year out, in lonely places, many miles away from shore, with only the seabirds for company. Others are on the lightships. These are the queerest of sailors—always out at sea and yet never going anywhere; for the big lightships are held fast with many heavy chains that are anchored on the sea bottom so that they shall always remain in one spot. Others of Uncle Sam's assists live on shore and only row or sail out each afternoon to light the lanterns that they have in charge. Some of them do not even need to row out. They can walk along shore and attend to their duties. Whenever those lights are lit they are inviolate. You have read of the sacred fires of old Rome. Uncle Sam's lamps are the sacred fires of the republic. Whoever dares to meddle with them would be sent to prison for many years, and he might even be executed for murder if his act should result in the drowning of anyone. It makes no difference, although the light happens to be only a common oil lantern on a pole stuck in the mud. For many years Uncle sam had a red lantern hung on a tree on a bank of the St. Croix river in Whitlock Mill, Me., to show the steamers and tugboats plying between Eastport and Calais where to make a certain turn to keep the channel. That probably was the most simple and rude lighthouse in the country. But it served its purpose for the time being, and it was just as official as the massive and powerful structures that cost $100,000 and more to build.

Where the lighthouses are far away from the land, as most of them are, Uncle Sam must manage in some way to feed his assistants who live on them and to keep them supplied with coal for themselves and for the engines that set the lights and steam whistles and bells going and with oil and other materials. He must be ready at a moment's notice to hurry to the relief of a lightship. So Uncle Sam keeps a big fleet of vessels that do nothing else but lighthouse business. They are of all kinds. There are about 35 big boats called tenders that are expected to go out in any storm that blows and any sea that rolls whenever necessary. He has a dozen big steam launches and 3 sail tenders. The big

1. From the New York *Sun*.

boats are fitted with immense derricks and booms, so that they can take hold of a huge iron buoy and its 90 or 100 fathoms of chain and the ton or so of rock or iron that is used for an anchor and pluck the whole thing clean out of the ocean bed, hoist it into the air and deposit it neatly on deck. More of these boats are sidewheelers. They differ from other sidewheelers because their paddleboxes are far astern, leaving plenty of room for the bow, which often sticks high out of the water. This is done to give the tenders ample room for carrying the big buoys and spars and other things needed by the lighthouse men. When the lighthouse boats came to be named, somebody with a pretty fancy gave them the names of American flowers and plants and trees. So the big fleet has these pretty names: Lilac, Myrtle, Golden Rod, Maple, Mayflower, Azalea, Verbena, Hazel, Mistletoe, Rose, Nettle, Gardenia, Cactus, Daisy, Thistle, Holly, Jessamine, Violet, Bramble, Wistaria, Waterlily, Snowdrop, Mangrove, Laurel, Arbutus, Clover, Pansy, Amaranth, Dahlia, Marigold, Lotus, Columbine and Lily. To make the coasts safe for ships it is not enough merely to keep the lights burning brightly; they must be of many different kinds. Some of them are fixed; that is, they shine steadily and without motion. Others are flashers. These lights revolve swiftly, and, as their glasses are ingeniously curved and full of angles, like your mother's cut glass bowls, they throw flashes of light out with perfect regularity. Still other lights are intermittent. They shine out for a certain number of seconds, and then they are dark for a short period, and then they shine again. Then there are lights that are red. Some of them are fixed and others are intermittent. Uncle Sam has a few green lights, too. But he likes neither the red nor the green, because the colored glasses interfere with the strength of the beams, and often, especially in the dreaded sea fogs, the sailors cannot see them until they are so close that their vessel is in danger before they know it. The method by which the lights are made to burn and turn is very simple, but it is the fruit of many experiments and much study. For instance, Uncle Sam has tried all sorts of oils and gas and electricity, and he has found that on the whole good kerosene oil is the best. So most of his lights are kept going with it. Still he has many buoys that are lit with gas that is contained in receptacles that float in the water, and other buoys are lit with electricity that is conveyed to them by submarine cables.

The shining crystal lantern lens is entirely round, like a huge fruit jar, without top or bottom. It is cut like a precious stone so that its face, instead of being plain, is full of points and curves to break the light and send its beams into given directions. This lens is set around the light itself. It rests on roller bearings like the ball bearings in bicycles, only much larger and more perfect. So beautifully poised is the lens that the least touch is enough to set it turning. The lights are graded according to power and size, as first, second, third and fourth-class lights. The ball bearing device is used for all except the first class, which have mighty lenses often weighing as much as 3 tons. They are revolved in a mercury bath which reduces the friction enough so that, despite their weight, they can be turned by clockwork, which is the way in which practically all the revolving lights of the country are kept in motion. Every mariner in the world who ever has occasion to bring a ship into a United States port is suppled with charts and descriptions showing just where the lights are and what kind they are. So, supposing that a captain were approaching a strange seaport on the American coast, he would steer by reckoning until he saw the first lighthouse. He would look into his chart and there would find that it was on a certain ledge of rock so many miles from the entrance to the harbor. The chart tells him also that 24 miles down the coast is another light, a white flash of the second order. So he sets himself and his deck watch to look out for it. Sailors call that picking up the lights. Perhaps Uncle Sam's sailing directions tell him that when he is abreast of the flashing light he must steer a little south or north or east or west, as the case may be, and then, after going 5 miles more, he will see a red light of the third order. Then, from there, he knows that he can turn in toward land, stand in, as a sailor would say. He stands in till a great, blinding flash shoots over the black sea.

This is a mighty lighthouse of the first order, whose lens turns so fast that the beams are like the winking of the lightning. The captain knows that it stands on a high hill near the mouth of the harbor, and from that time on he and his crew must keep their eyes open to pick up light after light, for Uncle Sam lights the channels of his big harbors as if they were streets nowadays. First they will see a little light that seems to be swimming on the surface. "Ah," says the captain, "gas buoy No. 7. That's the entrance to the channel." Before many minutes he sees another light swimming on the water. "Electric buoy No. 4," he says, and steers sharp westward, for the chart tells him that the channel turns here.

Once they have fairly entered a harbor like New York the sailors will see lights ahead of them in rows miles long. They light each side of the channel, show every bend in it, and mark the way for the ship so that it can go up as surely as a man could walk along a well lighted street. Not content with all these lamps, Uncle Sam has established what he calls range lights along the shores of his harbors. These lights stand in line with each other. Sometimes one will be on a reef off shore and the other will be a mile or more inland. The sailor knows that he is in the channel as long as he can keep the two in line, so that one seems to be right behind the other. When he has held his course as long as they serve him, he looks for the next range lights and again holds them in line until the floating buoys warn him to turn again. Thus, a captain not only knows that he is in the channel by watching the buoys, but he is able to steer perfectly straight and true by watching his ranges. And sailors steer almost entirely by ranges in inland waters.

Handling Fuel Oil at Railway Terminals.

Engineering News says that oil fuel for locomotives is now being used quite extensively on lines in California and Texas, and an important matter which the motive power officers now have to consider is the best means of handling the oil at terminals; that is to say, the means of delivering it from the tank cars to the storage tanks, and from thence to the tender tanks. This subject was made a matter of discussion at the July meeting of the Pacific Coast Railway Club, at San Francisco. All the information related to methods employed at different points on the Southern Pacific Railway, and from this information we have compiled the following particulars.

At Bakersfield, Cal., the tank cars are unloaded by means of air pressure, but this is a slow process, as the pressure is limited to 15 pounds, and there is considerable trouble from the cars not being airtight, besides which the heavy oil has to be heated in cold weather. It takes from 30 to 35 minutes to unload a car under the most favorable conditions The oil is led to a 2-compartment storage tank, and is fed direct to the tenders by means of air pressure from one or other of the compartments. It is considered by some, however, that the tenders can be filled much more rapidly by oil flowing by gravity from an elevated tank than by forcing it under air pressure from a surface or underground tank. Where this method is adopted, the oil may be forced by air pressure from the storage tank to the elevated tank, and then drawn from the latter as required.

At Los Angeles, Cal., about 50,900 barrels of oil are delivered to the engines every month, this being a larger amount than that handled at any other point. The tank cars are run up an incline from the freight yards to a track on the hill side behind the storage tanks, and the oil is discharged by gravity into a trench or conduit between the tracks, the elevation being such as to allow the oil to flow by gravity from the conduit to the storage tanks. This avoids the loss of time involved in making pipe connections to discharge each tank car. From the storage tanks the oil is piped by gravity to a 2-compartment distributing tank near the roundhouse, each compartment being of about 3,000 gallons capacity, and the oil is forced from the distributing tank to the delivery standpipes by compressed air. The admission and discharge of both the air and oil in this operation are automatically governed by a float arrangement in one of the distributing tank compartments. From the time the oil is delivered in cars by the yard force on the unloading track the only expense attaching to handling the 50,000 barrels of oil used per month is the compensation that goes to one man, and he makes tests of all oil received, and also renders reports to the office from which the bills are paid.

At Oakland, Cal., the oil is discharged from the tank cars into a 12-inch pipe, to which 8 or 10 cars are connected simultaneously, and from this pipe the oil is pumped to the storage tank. About 25,000 gallons per hour are handled. The pipe should be laid between two tracks and be long enough to connect with 12 cars, 6 on each track. The oil is again pumped from the storage tank to the elevated tank, from which it flows to the tender by gravity, or it can be pumped direct from the storage tank to the tender.

At San Bernardino, Cal., where only about 1,000 barrels of oil are used per month, the rails of the oil car track are level with the top of the receiving tank, which is loaded by gravity, and from which the oil again flows by gravity through a 4-inch pipe to a pressure tank connected to a standpipe and spout. For charging the tender, connection is made between the tank and the air brake hose at either end of the engine, a check valve in the 4-inch pipe preventing the air from escaping to the storage tank. This arrangement would not be practicable at points

where large quantities of oil have to be handled, while on the other hand it would not be economical to use the 2-compartment tank at a point handling only 1,000 barrels of oil per month.

At Tucson, Ariz., compressed air is used in unloading the tank cars, but (as at Bakersfield) there is much waste of air due to the fact that the cars are not air-tight. It has been recommended that the oil be discharged into a receiving tank. and thence forced by air at 50 pounds pressure to the storage tank, which arrangement is now successfully employed in forcing the oil from the storage to the high pressure tank. On this division steam has to be used to heat and thin the oil at some points, where the temperature sometimes falls to 32° F. This is specially the case with the California oil, which is thicker and heavier than the Texas (Beaumont) oil.

For small stations where air pressure is not available, small pumps are recommended for emptying the tank cars. A mining company uses for this purpose a small rotary pump driven by a 3-horse power gasoline engine, but a force pump operated by steam is considered as preferable, and the steam could be used to heat the oil when necessary. In some cases, however, gas generated by heating the oil has caused trouble in the pumps. The cost of pumping is estimated broadly at 3 cents per 1,000 gallons, and unloading by air pressure would cost about the same except where there was a surplus of air available. Either method is considered as being cheaper than building an elevated trestle from which to unload the cars by gravity, as the interest on cost of a trestle, and the repairs, would probably amount to more than the actual cost of unloading the oil by either pumping or compressed air. At one point, where as yet only four engines have to be supplied with oil, the tank cars are run up on to a coal trestle, and the tenders are filled by gravity by means of a hose from the tank car.

Peculiar Conditions in the Iron Trade.

Iron Age says that the conditions prevailing in the iron trade are noteworthy. Ordinarily the various branches have a fairly intimate relationship with one another. It has seldom happened that any one branch has been overrun with work while others are suffering from overproduction. The demand is usually of a general character. If pig iron is active the causes leading to that activity are of a character to affect the market for the finished product through the entire line. On the other hand, if the pig iron trade is drooping and prices are weak it is quite unusual to find any line of finished iron and steel enjoying great activity. At present, however, pig iron, steel billets, steel rails and structural shapes are in such demand that the market cannot be adequately supplied from domestic sources and large purchases are being made abroad. In steel plates and merchant bars the facilities of the home mills are fully employed. But in wire rods, wire, merchant pipe, sheets and tin plates, evidences of overproduction are apparent. In the sheet and tin plate trade particularly the competition for business is keen, and numerous mills have been obliged to close until the demand increases sufficiently to warrant their resumption.

The coal miners' strike and the insufficiency of railroad motive power are responsible in part for this irregularity in condition. If all blast furnaces fit for operation were able to get the necessary fuel the situation in the pig iron trade would not be so acute, although it is quite possible that even then some iron might have to be imported. The rate of consumption at this time seems clearly to be somewhat in excess of the full furnace capacity. With regard to steel billets, steel rails and structural shapes no doubt exists as to our deficiency in capacity, which has been apparent for some time. In these lines new construction has not yet become effective to the extent of even equalizing the supply and demand. But in wire rods, wire, merchant pipe, sheets and tin plates special effort has been put forth in fresh ventures of capital and the productive capacity is in excess of immediate requirements.

It is fortunate for the stability of the trade in general that the excess in productive capacity is in the finishing end and not in pig iron and steel billets. The scarcity and high cost of material thus preclude any serious reduction in prices. The mill or factory in need of orders hesitates to sacrifice its capital to secure a share of business and therefore discontinues operations. This is the direct result of the policy of the large manufacturers who discouraged high prices for finished products, thus keeping margins of profit too small to permit a heavy cut. It is possible that the excellent crops of this year and the profitable prices prevailing for all agricultural products may not only prolong the general prosperity of the country, but so increase the consumption of manufactured products as to restore to activity the idle mills and factories.

In the case of the tin plate works improved conditions are immediately promised as a result of the efforts to secure the business of consumers who have been purchasing foreign tin plates to get the benefit of the drawback on their export trade. The other lines must depend on an enlarged home demand, and it is earnestly hoped that they will be thus favored.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

At a recent meeting of the Directors of the Birmingham (Ala.) Railway, Light and Power Company it was ordered that the selling rate for gas should, under the terms of the existing agreement between the city and the Company, be put at $1.10 per 1,000 cubic feet, with a rebate of 10 cents per 1,000 for prompt payment. The new schedule is effective from the 1st inst.

Mr. F. B. Aldrich. General Manager of the Wyandotte Gas Light Company, of Bethlehem, Pa.. has been appointed to a like position in the affairs of the Pottsville and Schuylkill Haven (Pa.) Gas Companies. The last named properties were recently acquired by the capitalists in control at Bethlehem. Mr. Aldrich will have his headquarters at Bethlehem.

The project for the construction of a gas works at Bessemer (Ala.) is likely to materialize.

The City Council of Lancaster, O., has decreed that hereafter natural gas shall be sold by meter registration only, and that the selling rates shall be uniform.

Up to September 15th the United Gas Improvement Company had placed in Philadelphia 30,547 gas ranges.

It is announced by the proprietors of the Fredonia (N. Y.) Electric Light and Power Company and the Fredonia Gas Company that, on account of the increased cost of fuel and labor, an advance of 25 per cent. in the selling rates will have to be made. Under this decree gas for illuminating use will cost $1.75 per 1,000 cubic feet, and the rate for a fuel supply will be $1.25 per 1,000.

Justice E. B. Gager, of the Superior Court, has issued the following order, in respect of the proceedings relating to the taking over by the city of Norwich, Conn., of the Norwich Gas and Electric Company, for operation on municipal account:

The petition of the Norwich Gas and Electric Company against the city of Norwich, dated July 22, 1902, came before the undersigned authority at the city of Norwich, on the 1st day of August, 1902, at 2 o'clock in the afternoon, and, by continuance, to August 2, 1902, when the parties thereto appeared, by their witnesses and counsel, and were fully heard thereon. The petition was duly served upon the defendant, pursuant to the order of notice, as appears by the officer's return thereon. The respondent, the city of Norwich, filed its motion to dismiss the petition and application, as appears by said motion on file, which motion was overruled; thereupon said city of Norwich filed a demurrer to said application, as appears by said demurrer upon file, which demurrer was overruled; thereupon the respondent filed its answer, as appears by said answer on file, and the parties were duly heard upon the petition and answer, and it was found that said answer was untrue, and that the petitioner was entitled to the appointment of a commission as prayed for in said petition.

Whereupon, It is ordered and decreed that Henry C. White, Esq., of New Haven, Hon. Charles S. Mersick, of New Haven, and Hon. John M. Holcombe, of Hartford, be and they are hereby appointed a special commission under the provisions of an act of the General Assembly entitled "An act authorizing cities and other municipalities to establish plants for the manufacture of gas and electricity," passed at its January session, 1893, and approved June 23, 1893, and now appearing as Chapter CXXII. of the general statutes; and that an adjudication be made by said commission whether the property contained in the schedule set forth in said petition, real and personal, including rights and easements, properly belongs to the plants described in said petition, and should be sold by said Norwich Gas and Electric Company and purchased by said city of Norwich, and what the time, price and other conditions of sale and delivery thereof shall be, and that said commission report its doings to the Superior Court for New London county, in which said plant is located, for confirmation by said Court. By agreement of counsel said commission is appointed as of August 2, 1902.

The commission above named is certainly a responsible one, for of its members Mr. H. C. White is a leading member of the New Haven

county bar; Mr. C. S. Mersick is President of the Merchants' National Bank of New Haven, and Mr. Jno. M. Holcombe is President of the Phenix Mutual Life Insurance Company, of Hartford.

MR. GEORGE ALLYN, a son of Mr. H. A. Allyn, Superintendent of the Cambridge (Mass.) Gas Light Company, has been appointed Superintendent of Distribution for the Providence (R. I.) Gas Company.

THE purchasers of the Halifax (N. S.) Electric Tramway Company, who recently acquired control of the Peoples Heat and Light Company, have decided to abandon the coke oven process and install in its place a water gas plant of 450,000 cubic feet capacity, the contract for which has been secured by Mr. J. A. Mayers for the Western Gas Construction Company. It is also the intention of the Tramway Company to erect a small coal gas plant, the regenerative system of bench firing to be followed.

THE authorities of Pottsville, Pa., are insisting that the local Company's charges for gas are too high. If they will only wait a while, and a short while at that, the new owners of the Company will see to it that equitable rates will prevail.

MR. W. H. VOLLUM has resigned from the service of the New York and Richmond Gas Company, Staten Island, N. Y., to accept a responsible position in the office management of the New Orleans Lighting Company.

THE Inverted Incandescent Gas Light Company, of America, has been incorporated by Messrs. Bankson Taylor, T. L. McConchie and Clarence H. Murphy. It is capitalized in $100,000, and its headquarters are said to be at Point Pleasant Beach, N. J.

THE St. Joseph (Mo.) Gas Company has purchased a plot of ground between Third and Fourth and Cedar and Atchison streets, on which is to be constructed a plant for the working up of its tar and ammonia product.

A CORRESPONDENT in Cincinnati forwards the following: "The question of awarding a franchise for the furnishing of gas to the city of Newport, Ky., and its inhabitants for a certain period, with which the General Council of Newport has been wrestling for the past year without arriving at any conclusion, was finally settled when the City Council adopted the Moeschi resolution that passed the Board of Aldermen at its last meeting, and it is now left to the people to settle the matter to their own satisfaction. The following is the resolution:

"*Be it Resolved* by the General Council of the city of Newport, Ky., that the question, 'Shall the Mayor and General Council of the city of Newport, Ky., at once enter into a contract with the Union Light, Heat and Power Company to supply the city and the inhabitants thereof with gas for illuminating purposes at the rate of $1 per 1,000 cubic feet, and gas for fuel purposes at the rate of 75 cents per 1,000 cubic feet, for the period of 15 years from the date of said contract, the new contract to cancel the old and be in effect at once?' be submitted to a vote of the citizens of Newport, Ky., and the Clerk of the County Court is hereby directed to have said question printed upon the ballots to be cast in the city of Newport, Ky., at the election to be held Tuesday, November 4, 1902, with proper arrangements to take the vote of 'No' and 'Yes.'"

THE gain in output at Lancaster, Pa., is nothing short of astounding. The percentage showing for August was 100.

MR. HENRY ROCHAT has been appointed Superintendent of the gas division of the properties of the San Antonio (Tex.) Gas and Electric Company, vice Mr. A. F. Jenkins. If we mistake not, Mr. Rochat was recently in the employ of the New Orleans Lighting Company.

THE Messrs. Coffin deny positively that it is the intention of the proprietors of the Mohawk Gas Company, of Schenectady, N. Y., to dispose of that property to the local electric lighting concern.

A CORRESPONDENT in Scranton, Pa., forwards the following, under date of September 29th: "An unusual case was brought last week by George Oehler and Phœbe Oehler against the Scranton Gas and Water Company, in which they sue for $10,000 damages. The information avers that on November 26, 1899, a child was born to Mr. and Mrs. Oehler, who live at 1046 North Webster avenue, and until October, 1900, it enjoyed good health. In July, 1900, the Scranton Gas and Water Company laid a gas main in close proximity to the sewer pipe, and in October this leaked, the gas passing through the sewer pipe to the house. He reported the incident to the Company, but it was not until April, 1902, that the break was repaired. The child became ill and was afflicted with a number of abscesses which formed on her right hip, eating away the flesh, thereby crippling her for life. Her health was also impaired in that she suffers from indigestion. Her illness, the plaintiffs contend, is due to the quantity of gas which passed into the house as a result of the leak and for this reason they bring the suit. Attorneys Charles E. Oliver and Walker & Hill represent the plaintiff. The Company had up to the time of writing not put in an answer. I will keep you posted respecting the case."

THE Suburban Gas Company, of Philadelphia, is giving an exhibition of gas appliances at its handsome offices in Chester. The display, which is to last for the first two weeks of this month, is mainly intended for the "edification" and instruction of the residents of its Upland and Eddystone districts. The display may be inspected daily, from 8 A.M. to 6 P.M., and from 7 P.M. to 9 P.M.

THE Suburban Gas Company, of Chester, Pa., is arranging to extend its main system to the borough of Marcus Hook.

HENRY R. MARCOTT, Superintendent of the Citizens Gas and Electric Company, of Pekin, Ills., is no longer in its employ.

THE Board of Gas and Electric Light Commissioners of Massachusetts has under consideration the appeal of the Adams Gas Light Company for permission to take over completely the business and properties of the Adams, Light and Power Company. The argument over the appeal was to have been had last Friday. There is no doubt that the permission will be granted.

THE Township Board, of Ecorse, Mich., has assented to the application of the Wyandotte (Mich.) Light and Fuel Company for the right to distribute gas in the first named place. The grant is to run for 30 years, and the maximum selling rates fixed are: On illuminating account, $1.25 per 1,000; for fuel use, $1.10.

THE proprietors of the Ann Arbor (Mich.) Gas Company are said to have secured the control of Ypsilanti (Mich.) Gas Company. Should this be so it is fair to presume that the purchasers of the Ypsilanti plant would in time put it out of commission, since the supply of both places could easily be carried on from Ann Arbor.

THE new proprietors of the Fishkill and Matteawan (N. Y.) Gas Company have very sensibly determined on adequately piping the streets of Fishkill Landing.

THE KNOXVILLE (Tenn.) Company has changed ownership, Col. A. H. Leftwich, a Baltimore broker, having secured the stock hitherto owned by the Swepson estate, and Mr. J. Y. Johnson. Title in the ownership will not be formally taken over until December 1st. Mr. Leftwich says that the plant will be rebuilt.

THE Uncowa Water and Lighting Company, which was incorporated some time ago to supply gas and water to the residents of Fairfield and Southport, Conn., has filed a certificate of dissolution. The lighting rights of the concern have been purchased by the Bridgeport Gas Light Company, which will next year extend its main system to and through the streets of Fairfield and Southport.

THE authorities of Guthrie, Oklahoma, have given final consent to the proposition of J. J. Novak and associates to establish and operate a gas plant at that point.

MESSRS. J. J. MCALESTER, A. U. Thomas, H. Townsend and others have incorporated the Choctaw Gas Company, for the purpose of supplying gas for light, heat and power in South McAlester, I. T.

ACCORDING to Mr. E. W. Parker, in his "Mineral Resources of the United States," 1901, the statistics respecting accidents in coal mining for that year may be thus summed up. In 18 States and Territories 1,467 lives were lost in 1901, and 3,643 men were injured in coal mining. For each life lost the number of tons mined varied from 426,094 in Maryland to 49,424 in Indian Territory. The total number of men employed in these coal mines was 485,544; of these 145,309 worked in the anthracite mines. In the Pennsylvania mines, 513 men were killed and 1,243 injured in the anthracite mines, and 301 killed and 656 injured in the bituminous mines.

The Market for Gas Securities.

Uneven but high money rates, the horribly muddled condition of the coal market and a general feeling of distrust are making a pretty mess of it all in gas share trading. Of course, quotations are lower, but the real wonder is that they remain at the present levels. Consolidated shows only a net loss of one point in the bid price for the week, closing to-day (Friday) at 219½ to 220. The Company is importing large quantities of Welsh anthracite, some thousand tons of which have been received. The demand for gas in the city is tremendous.

The drop in Brooklyn Union was quite pronounced. It is now 232 to 235 as against 235 to 245 a week ago. The Company's position in respect of gas making materials is really serious. Peoples, of Chicago, is steady, and Consolidated, of Baltimore, is down to 72½ bid. Washington gas shows no change of moment. All of the New England Gas and Coke Company's 5 per cent. bonds and all of the stock, save less than 300 shares, have been deposited under the reorganization plan and a settlement has been reached without resort to the courts. Accordingly, the New England Gas and Coke Company is no longer in existence.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

OCTOBER 6.

☞All communications will receive particular attention.
☞The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	219¼	220
Central Union, Bonds, 5's.	3,000,000	1,000	110	112
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,800,000	1,000	118	120
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	350	..
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. .. Bonds, 5's	11,000,000	1,000	112¼	113
Northern Union, Bonds, 5's.	1,250,000	1,000	108	110
New York and East River.. Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	.	109	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	
Standard	5,000,000	100	130	140
Preferred	5,000,000	100	150	160
Bonds, 1st Mortgage, 5's	1,500,000	1,000	115½	118
Yonkers	299,650	500	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	232	235
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	1¼	1⅝
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	10¾	11
" " Bonds, 5's	5,256,000	1,000	79	81
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000		
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	100¼	100¾
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¾	89¼
Preferred	3,026,500	100	107½	109
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	72¼	73¾
Mortgage, 6's	3,600,000	..	..	115
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	85	87
Consolidated G. & E. Co.'s. Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Sept. 10, 1902.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Oct. 15th, 1902, to stockholders of record at the close of business, Sept. 30, 1902. Checks willbe mailed.

1423-5 LEWIS LILLIE, Treasurer.

Position Wanted.

A YOUNG MAN, 28 years of age, sterling habits, gilt-edge references, 11 years in the gas and electric business, at present Manager in town of 10,000, desires position as Secretary or Manager of gas or electric plants in city of not less than 20,000.

1425-4 Address, "L.," care this Journal.

THE

Lumo Triple Arc.

THE cut herein shown is the only explanation necessary. The beauty of the fixture, together with the brilliancy and cheapness of operation, is what does the talking. The Triple Arc is equal in candle power to any gas arc lamp upon the market, and will only consume from 9½ to 10 feet of gas per hour.

The construction of the fixture is simplicity itself, and there is absolutely nothing to get out of order. In fact, we guarantee it to be satisfactory in every particular. We will send a sample lamp on 30 days' trial to any gas company. Any infringement of these designs will be prosecuted.

ACORN BRASS WORKS MFG. CO.,

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Gas Analyses of All Sorts and Conditions,

—OR—

Analyses of Solid and Liquid Materials as Well,

That are needed by Gas Companies at any time in the conduct of their business, may be obtained from

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WANTED,

A GAS SUPERINTENDENT

Who understands water and electrical works management. State fully past experience, age, whether married, and salary expected.

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WANTED,

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Good wages to one with New York engineers' license. Address, "J.,"
1425-2 Care this Journal.

WANTED,

A Good Retort House Foreman.

1424-tf Address, "GAS COMPANY," care this Journal.

WANTED,

Second-hand Station Meter,
from 60 to 72 inches diameter.

Four Purifying Boxes, 9 feet by 12 feet, or about that capacity.

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PITTSFIELD COAL GAS COMPANY,
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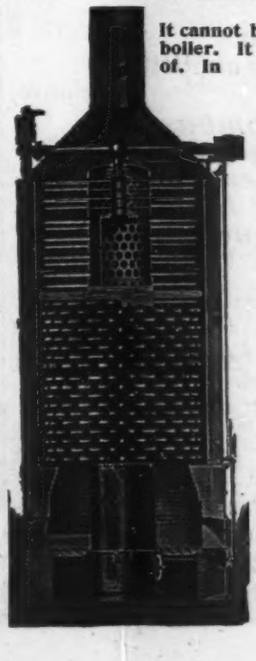
SCALE—THE ENGINEER'S TORMENT.



It cannot be kept out of the boiler. It must be disposed of. In

HAZELTON WATER TUBE BOILERS

mud and scale-forming materials are deposited below the grates. They cannot be baked into a hard mass because they are away from direct heat. A manhole and plate are provided for economical and thorough removal.

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Gas properties,
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Also desirable franchises.

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ARC GAS LAMP.

Durability,
Efficiency,
Simplicity,
Economy.

Perfect Combustion.
No Chimneys to Break.
No Matches Necessary.
Consumes Less Gas.
A Handsome Fixture
Always in Order.

Our lamp gives 25 per cent. ***more light*** with 20 per cent. ***less gas*** than any Arc Gas Lamp now on the market.

TO LIGHT CONSUMPTION WHAT THE GAS RANGE IS TO FUEL. : : : : :

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Solicited.

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Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.

Ammonia Concentrator.

Not Expensive. Write to STROH & OSIUS, Pat'ees, or Mich. Ammonia Works, Detroit, Mich.

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Decrease your distribution worries.

Increase your customers' satisfaction.

It's good for any pressure, even variable.

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With Adjustable Gas Check, on Entirely New Principles. If your jobber does not carry it order direct from

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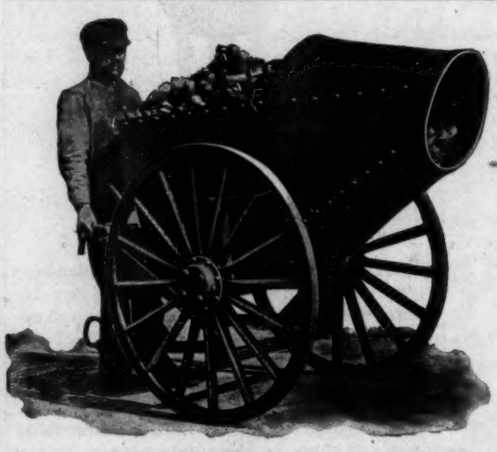
Office 332 East 28th Street, New York City.



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Coke Wagons,
Steel Wheelbarrows.

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THE PURIFIED GAS REVIVES THE FOULED OXIDE.

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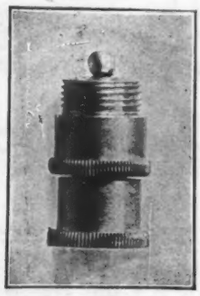

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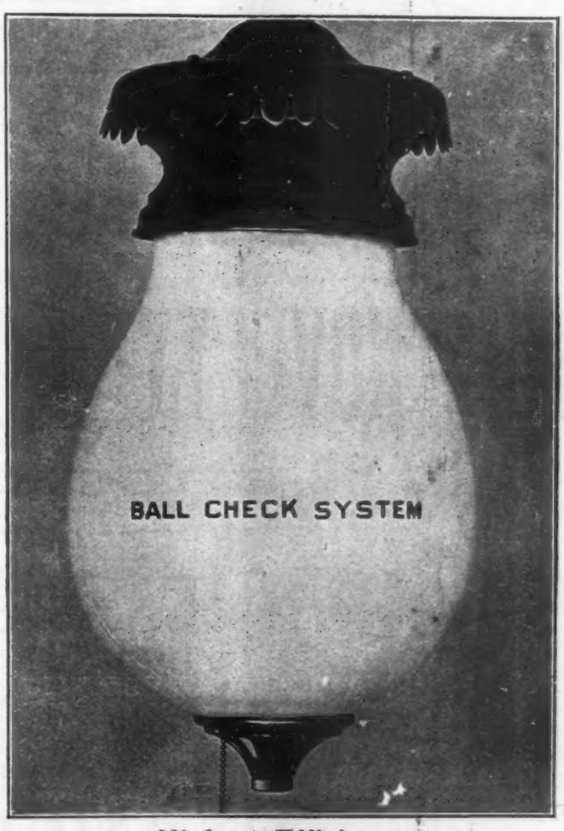
AND YOUR LIGHT IS BRIGHT.

ANY CANDLE POWER. CAN'T CLOG.



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MORE LIGHT, LESS GAS.

That's "The Story."

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ANY GAS—ANY PRESSURE—INSTANT ADJUSTMENT.

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Why?

Because the Ball Check spreads and breaks up the gas, also checks the flow, but maintains the initial pressure of gas. The common mantle burners with the Ball Check light up to the top full mantles of any length up to six inches. **No more long mixing tubes.** The **Ball Check** takes one just **one and one-half inches long.**

Want to try one?

We will send by mail, postage paid, to any gas company or dealer, a sample Ball Check, upon receipt of a dime--they retail for a quarter--that will fit an ordinary cheap mantle burner. It tells its own story in just a minute.

Ball Check Light Company,

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Lessens vibrations. Never bends.

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To Retain Fluid Material of Any Sort.

PIPING IN AND AROUND GAS WORKS.

Work Done for Several of the Largest Gas Companies in America Stands as Reference.

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BY UTILIZING A
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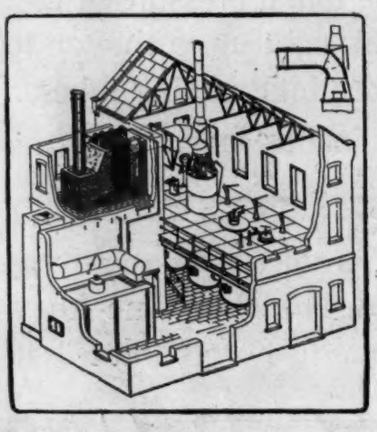

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Write for full particulars how this is accomplished, the saving effected, and the advantages gained, to the

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Of Uniform Excellence and Greatest Candle Power.

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We can supply complete Coal Handling installations, every piece of machinery being made in our works. We have been in this special line of business since 1872, and our coal handling machinery is in use in every port in America, and in almost every country in the world.

We shall be glad to receive plans and descriptions of proposed plants from parties desiring to make improvements, to which it will give us pleasure to reply, giving such information as it is in our power to do.

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The Best Light in the World

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Stores, Churches, Halls or any large indoor areas.

Guaranteed to give a greater volume of light, better diffused and steadier than an electric arc.

A Complete Revolution in Gas Lighting.

A sample lamp sent on 30 days' trial to any Gas Company.

This lamp is thoroughly protected with both Mechanical and Design Patents. Imitation of this Design and Construction will be prosecuted.

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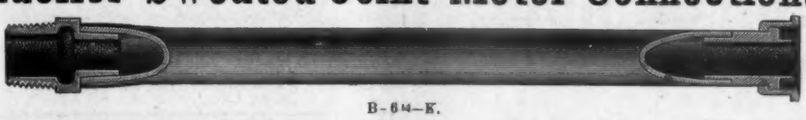

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Mueller Sweated Joint Meter Connections yield most profit to the gas man. They are formed by machinery and are a great deal cheaper than the hand made kind.

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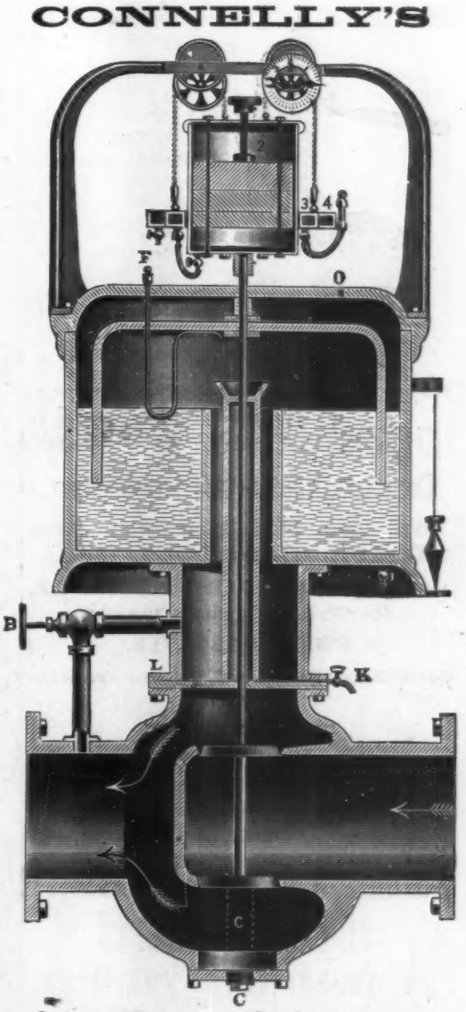

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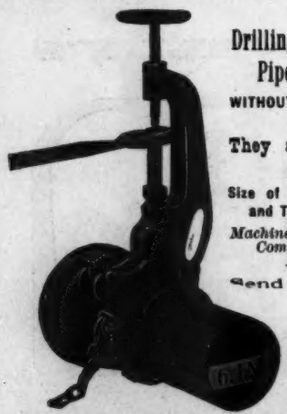

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Their Construction and Arrangement,

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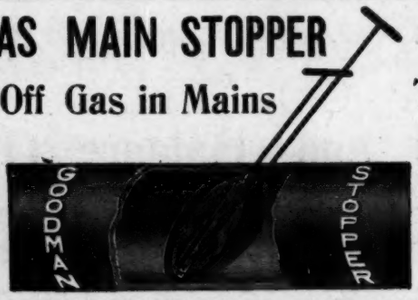
For Shutting Off Gas in Mains

Any size gas main can be shut off in 30 seconds. : : :



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Humphrey Crescent Instantaneous Water Heaters,

A LUXURY and NECESSITY.

This is Our No. 2 Heater.

Supplies hot water for domestic use as well as for the bath.

It Has No Equal

LIST PRICE NICKEL PLATED, $35.00,

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Every Heater Guaranteed.

SEND FOR CATALOGUE AND PRICES.

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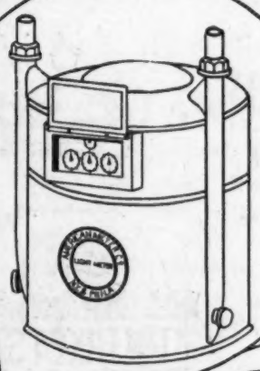

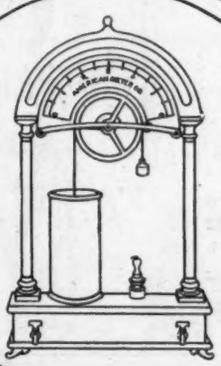

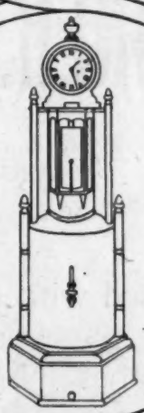

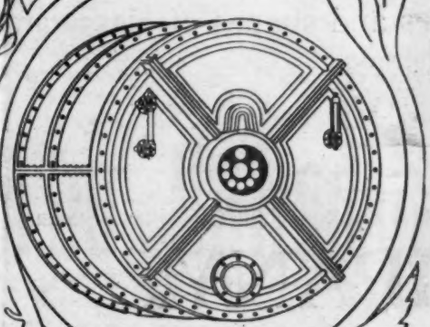

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NEW YORK AND PHILADELPHIA,

CHICAGO, ST. LOUIS,

SAN FRANCISCO.

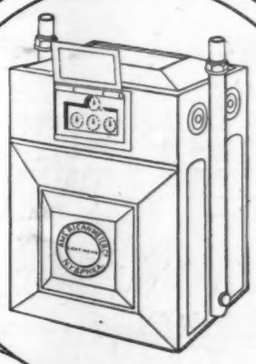
PUBLIC LIGHTING TABLE.

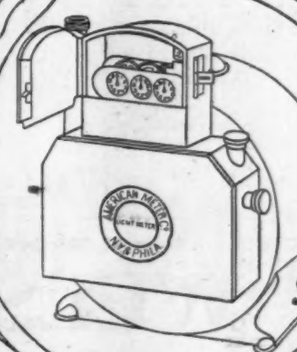
OCTOBER, 1902.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Wed.	1	6.10 PM NM	5.00 AM	5.30	5.00
Thu.	2	6.10	5.00	5.30	5.00
Fri.	3	6.10	5.00	5.30	5.00
Sat.	4	6.10	5.00	5.30	5.00
Sun.	5	6.10	5.00	5.30	5.00
Mon.	6	7.50	5.00	5.30	5.00
Tue.	7	8.30	5.00	5.30	5.00
Wed.	8	9.20	5.00	5.20	5.10
Thu.	9	10.20 FQ	5.00	5.20	5.10
Fri.	10	11.10	5.00	5.20	5.10
Sat.	11	12.10 AM	5.00	5.20	5.10
Sun.	12	1.10	5.10	5.20	5.10
Mon.	13	2.10	5.10	5.20	5.10
Tue.	14	3.20	5.10	5.20	5.10
Wed.	15	No L.	No L.	5.10	5.20
Thu.	16	No L. FM	No L.	5.10	5.20
Fri.	17	No L.	No L.	5.10	5.20
Sat.	18	5.40 PM	7.20 PM	5.10	5.20
Sun.	19	5.40	8.10	5.10	5.20
Mon.	20	5.40	9.10	5.10	5.20
Tue.	21	5.40	10.10	5.10	5.20
Wed.	22	5.40	11.10	5.00	5.30
Thu.	23	5.40 LQ	12.20 AM	5.00	5.30
Fri.	24	5.40	1.20	5.00	5.30
Sat.	25	5.40	2.30	5.00	5.30
Sun.	26	5.30	3.30	5.00	5.30
Mon.	27	5.30	5.30	5.00	5.30
Tue.	28	5.30	5.30	5.00	5.30
Wed.	29	5.30	5.30	4.45	5.35
Thu.	30	5.30 NM	5.30	4.45	5.35
Fri.	31	5.30	5.30	4.45	5.35

TOTAL HOURS LIGHTING DURING 1902.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	238.30	January	423.20
February	196.20	February	355.25
March	196.20	March	355.35
April	166.40	April	298.50
May	151.40	May	264.50
June	131.10	June	234.25
July	142.40	July	243.45
August	162.00	August	280.25
September	179.00	September	321.15
October	216.30	October	374.30
November	224.10	November	401.40
December	250.00	December	433.45
Total, yr.	2255.00	Total, yr.	3987.45





NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

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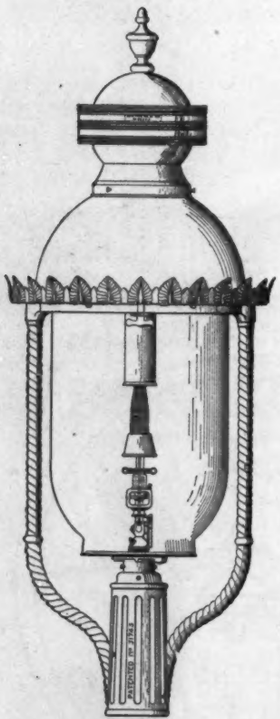
.... OF AMERICA ....



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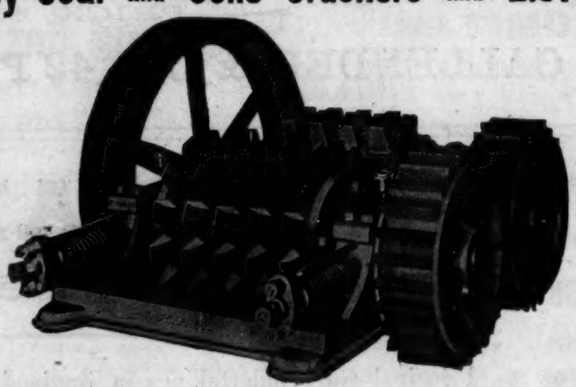

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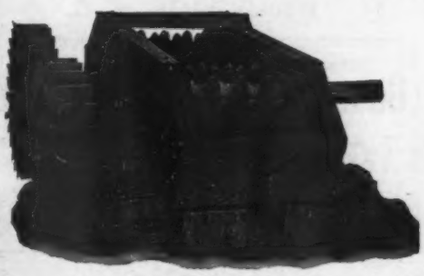

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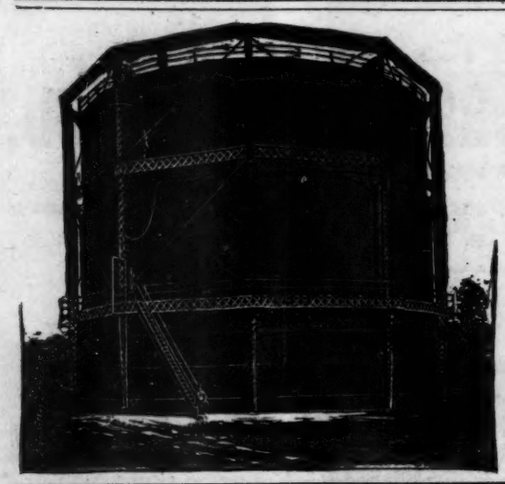

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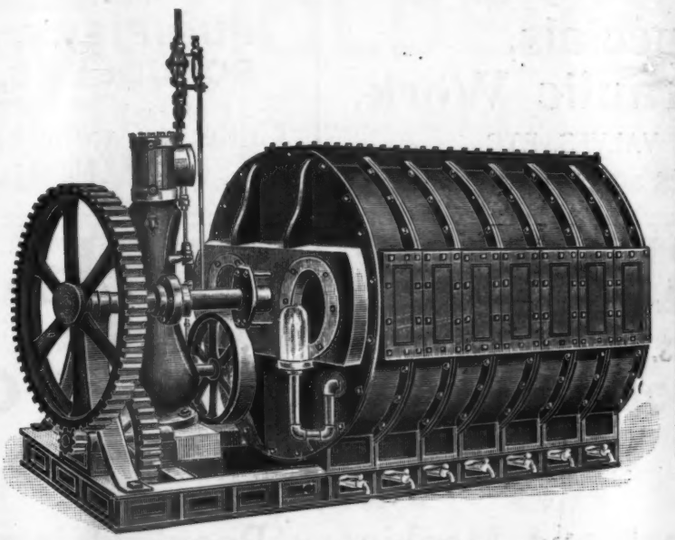

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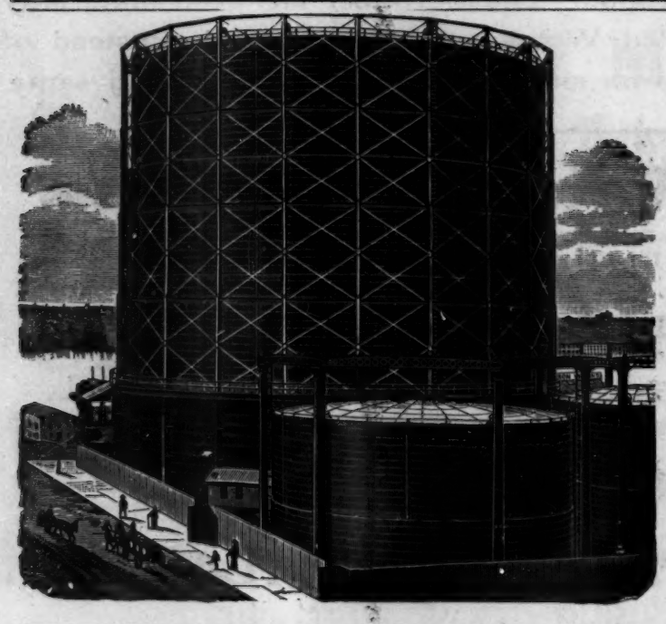

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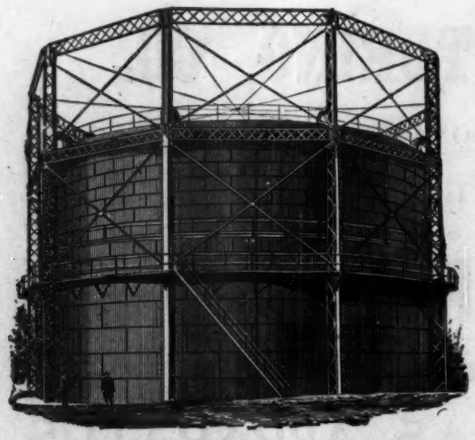

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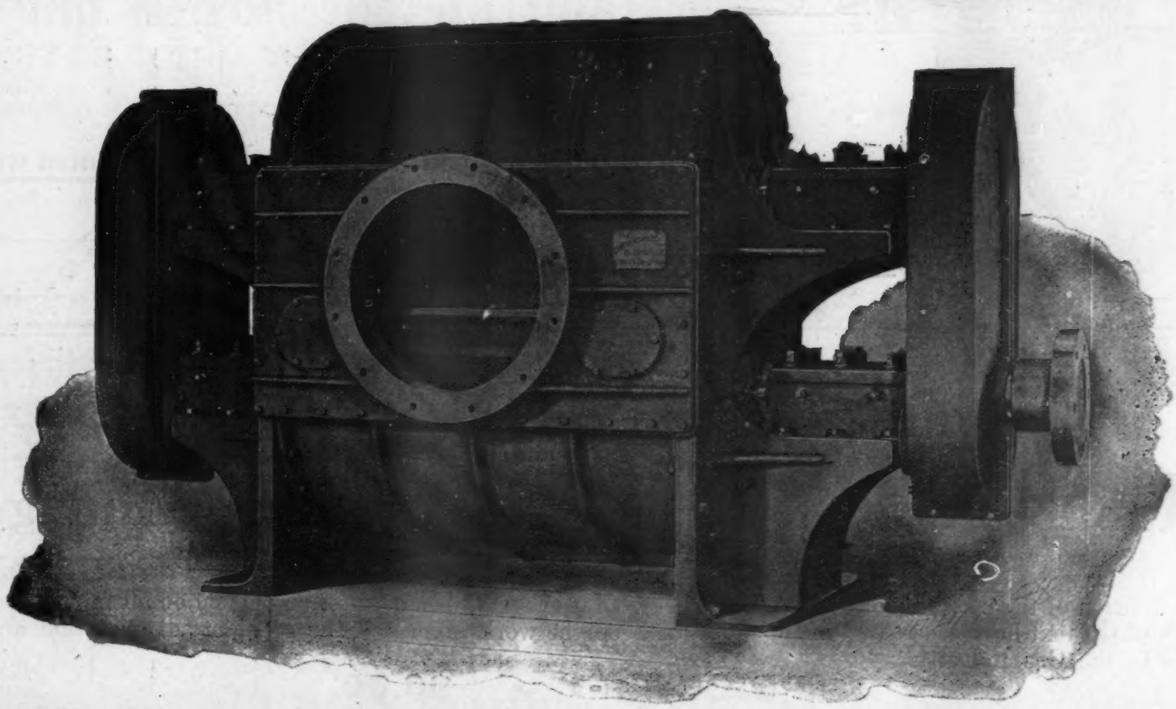

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